



User's Manual

# SynthSpider

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# INDEX

## A. BEFORE YOU START

---

<b>1 ABOUT THIS USER MANUAL</b>	<b>9</b>
<b>2 INSTALLATION GUIDE</b>	<b>9</b>
<b>3 REGISTERING SYNTHSPIDER</b>	<b>10</b>
<b>4 QUICK MIDI SETUP GUIDE</b>	<b>11</b>
<b>4.1 Introduction</b>	<b>11</b>
<b>4.2 Using SynthSpider with OMS</b>	<b>11</b>
4.2.1 Using OMS via IAC driver	12
4.2.2 Using OMS with virtual nodes	16
<b>4.3 Configuring the software for FreeMIDI</b>	<b>18</b>

## B. SYNTHSPIDER DESCRIPTION GUIDE

---

<b>1 WHAT IS SYNTHSPIDER?</b>	<b>23</b>
<b>2 DUY SYNTHSPIDER INTERFACE</b>	<b>24</b>
<b>2.1 Edition bar</b>	<b>26</b>
2.1.1 Patch Manager button	26
2.1.2 Edit buttons (Copy, Paste, Undo, Redo)	30
2.1.3 Memory buttons	30
<b>2.2 SynthSpider visualization/operation modes</b>	<b>31</b>
2.2.1 Edit and Run modes	31
2.2.2 90° view/Direct view	32
<b>2.3 Working tools</b>	<b>33</b>
2.3.1 Arrow	33
2.3.2 Eraser	33
2.3.3 Patcher	34
<b>2.4 Modules</b>	<b>35</b>
<b>2.5 Save/Load and Auto/Manual</b>	<b>35</b>
<b>2.6 System/MIDI</b>	<b>37</b>
2.6.1 System Settings	38
2.6.2 MIDI Setup	38
2.6.3 Voice Management and MIDI Architecture	39

<b>2.7 MIDI Channel/Group</b>	42
<b>2.8 Information, Help and DSP Preferences</b>	44
2.8.1 Patch Information	44
2.8.2 Help	45
2.8.3 DSP Preferences	46
<b>2.9 The Logo</b>	47
<b>2.10 Working surface</b>	47

## C. SYNTHSPIDER MODULE DESCRIPTION

---

<b>PRELIMINARY INTRODUCTION</b>	49
<b>MODULE DESCRIPTION</b>	51
1- SLIDER	51
2- PLASMA METERS	54
3- NUMERIC READOUT	55
4- TEXT LABELS	57
5- SCALES	58
6- SCOPES	59
7- SHIFT RIGHT	60
8- SHIFT LEFT	61
9- ABSOLUTE VALUE	61
10- INVERT	62
11- ADDITION (AND LOGICAL OPERATOR)	62
12- SUBTRACTION	64
13- MULTIPLICATION	64
14- NOISE GENERATOR	66
15- SAMPLE & HOLD	67
16- ONE-POLE LOW-PASS FILTER	68
17- ONE-POLE HIGH-PASS FILTER	69
18- TWO-POLE LOW-PASS FILTER	70
19- TWO-POLE HIGH-PASS FILTER	71
20- TWO-POLE BAND-REJECT FILTER	71
21- TWO POLE BAND-PASS FILTER	72
22- OSCILLATOR	73
23- TRIANGLE OSCILLATOR	77
24- SQUARE OSCILLATOR	78
25- PITCH TRACKER	79
26- RAMP GENERATOR	80

27- SHAPER	81
28- ENVELOPE FOLLOWER	82
29- ENVELOPE GENERATOR	84
30- DYNAMIC WAVE GENERATOR	85
31- SEQUENCER	87
32- MIXER	89
33- ONE SAMPLE DELAY	90
34- WAVESCAN	91
35- KARPLUS-STRONG	92
36- CHORUS	93
37- MIDI NOTE	95
38- MIDI VELOCITY	98
39- MIDI GATE	100
40- MIDI CONTROLLER	102

#### D. TUTORIAL GUIDE

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<b>1</b>	<b>HOW TO CREATE A TRACK ARRANGEMENT TO USE SYNTHSPIDER</b>	106
<b>2</b>	<b>GUIDE TO BUILD A SIMPLE SYNTHESIZER FROM SCRATCH</b>	111

#### E. APPENDIX

---

<b>COMMANDS AND SHORTCUTS</b>	125
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### WARNING!

Remember to use SynthSpider with your monitoring system very low. It's easy to produce high level sounds when you are connecting modules, especially when you create feedback or make a module or a group of modules unstable. If you don't follow this advice, you may damage your speakers.





## A) Before you start

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### 1) About this User Manual

Thank you for purchasing this copy of DUY SynthSpider. We hope you enjoy using this software. We advise you to read through the information provided in this book, which intends to guide you through the functioning of the software.

We have structured the book in 5 chapters:

- **Chapter A:** First approach to SynthSpider. Provides general information on how to configure and approach SynthSpider at first.
- **Chapter B:** SynthSpider Description Guide. This section explains in depth how SynthSpider works.
- **Chapter C:** Modules Description. A complete description of all the available modules inside SynthSpider.
- **Chapter D:** Tutorial with information on how to create a 4-voice pad and how to build a synthesizer preset from scratch.
- **Chapter E:** Appendix with commands and shortcuts.

### 2) Installation Guide

To install SynthSpider from your CD, we advise you to read the instructions contained in the "Installation Guide" in your SynthSpider CD. The main steps you have to follow are:

- Double-click on the "SynthSpider Installer" application. The License Agreement will be displayed on the screen during this installation process. You must read this License Agreement.
- Choose on which volume of your computer you'd like to install the plug-ins.
- You will then be asked to insert your serial number. You can find the serial number printed on the SynthSpider registration card. Please keep this serial number handy and don't disclose it to anyone. It's your personal number, and once you've registered you'll be granted special privileges with this code, such as downloading updates from our website among others.
- You will be able to use DUY SynthSpider for 15 days on your computer from the moment

you install the software. Every time you startup your computer, you will be reminded of how many days you have left before the demo period expires.

- To authorize SynthSpider permanently on your system, click the "Request Authorization" button.
- Copy the challenge phrase very carefully on the registration card, or use the "Copy Challenge" button to authorize online.
- Once you've sent in the registration card or registered online, we will get in touch with you by fax or email to give you a response to the challenge. So the next time the message shows, click on the "Request Authorization" button, and type the response we'll give you in the "Response" field. You should not be asked to enter the response ever again.
- Remember it's very important to register the software in order to receive a response from DUY to authorize the plug-ins permanently.

### 3) Registering SynthSpider

You can register DUY SynthSpider in any of the following ways:

- **By fax:** Send your completed registration card to +34 932 176 313.
- **By email:** scan your completed registration card and send it as an attached JPEG or GIF file to [registrations@duy.com](mailto:registrations@duy.com)
- **Online.** At <http://www.duy.com/register>

For further information on DUY's software or registration issues, please visit **[www.duy.com](http://www.duy.com)**

## 4) Quick MIDI Setup Guide:

Once you have installed the software, you should setup the most important parts in order to make SynthSpider function in a correct way.

### 4.1) Introduction

The use of MIDI is fundamental with this piece of software. DUY SynthSpider is compatible with Mark of the Unicorn's FreeMIDI and with Opcode's OMS (Open MIDI System). Both systems represent a complete solution to communicate via MIDI protocol, either internally (inside the computer) or between the computer and any external devices.

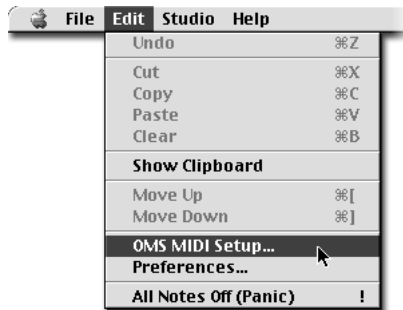
### 4.2) Using SynthSpider with OMS

SynthSpider is compatible with OMS in two different ways: through virtual nodes and using the IAC driver (Inter Application Communication). Before you choose which of these functioning modes you'll prefer for your system, you must configure OMS to function with SynthSpider.

Locate Opcode's OMS folder in your hard drive. Inside that folder you should find the "OMS Setup" application. Double-click on its icon to proceed.



Choose the 'OMS MIDI Setup...' option from the "Edit" menu:



A dialog box will show you the following options:



Please make sure that the 'Run MIDI in background' option is activated.

**IMPORTANT:** if this option is NOT selected, the MIDI information that reaches SynthSpider may be timely unprecise and could sound "chunky".

#### 4.2.1) Using OMS via IAC driver.

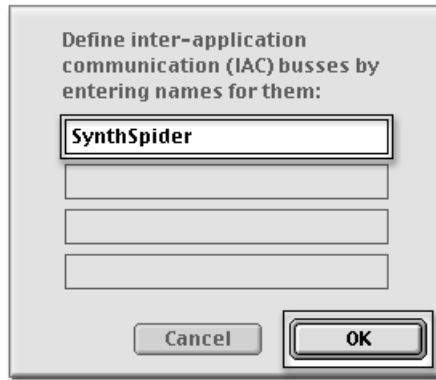
This mode allows SynthSpider to connect to any other existing node inside your MIDI configuration, regardless of the kind of node it is. This means that OMS will be in charge of communicating with SynthSpider directly. To do so, please follow these steps:

- Double-click on the 'OMS Setup' icon.
- Once the application is open, you can see the "Active Setup" of the MIDI configuration. Locate the IAC Driver icon:



**IMPORTANT:** If you don't see the IAC Driver icon, you may not have installed the driver when you installed OMS. To obtain it, use the OMS installer, selecting a "custom" install and choose the IAC driver.

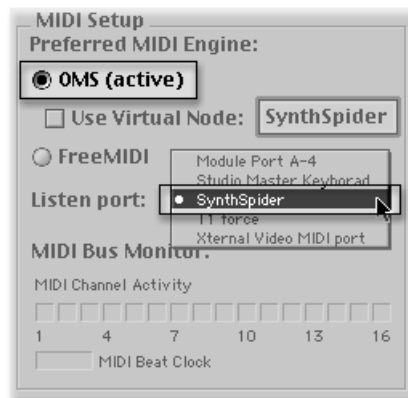
- Double-click on the IAC icon. A new window will appear, similar to this one:



- You will now have the opportunity to choose a name for the node which will be used for SynthSpider. Although you can choose any name, we advise you to type in the word 'SynthSpider', as seen in the figure above (letter "S" in capitals), due to the fact that some of the references and examples contained in this manual have been detailed with this name.
  - Once you have typed "SynthSpider" in the provided space, press "OK".
  - You can now quit the "OMS Setup" application. Save the changes to make them permanent, using the "Save" button.
  - You should now let SynthSpider know which node is going to connect DUY's software to OMS. Open your audio program and insert an instance of "SynthSpider Advanced" in an available track. It's irrelevant if you insert it in a mono, mono-to-stereo or stereo-to-stereo track. Locate the "System/MIDI" button at the bottom left side of SynthSpider's display (we will call the left part of the screen "Palette" and the right side "Working Surface"):
- Click on the 'System/MIDI' button. A new window will appear, allowing you to setup the System's values and the MIDI parameters for SynthSpider. Among them, the MIDI setup, which will allow you to define the kind of node and MIDI engine, among others.



Make sure the OMS button is selected and verify that the 'Use Virtual Node' button is NOT selected.

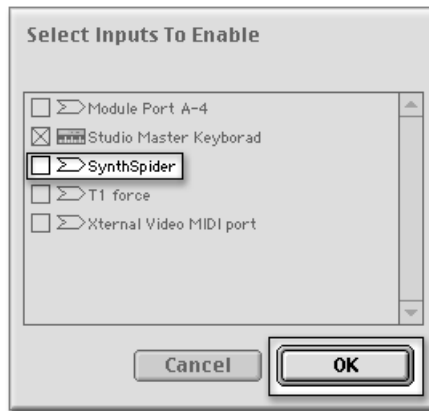


You should also select the MIDI node that SynthSpider will be receiving information from. In this case, the node we created with the IAC driver: 'SynthSpider'.

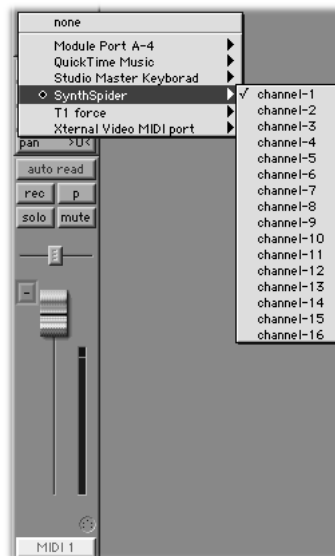
As you can see, you can connect the node directly to any other OMS node, including controller keyboards (like the 'Studio Master Keyboard' listed in the menu as you can just about see in the image above).

**IMPORTANT FOR PRO TOOLS USERS:** With this kind of connection, SynthSpider will read all the information that reaches the node. Some programs such as ProTools make MIDI data connections to send the information to the nodes. In the case of ProTools, this "information re-sending" produces double MIDI information in the SynthSpider node. To avoid this from happening in ProTools, you must de-activate SynthSpider's IAC node from ProTools in the following way:

- Locate the MIDI menu in ProTools, and from there the 'Input Devices...' option. A new window will appear with the available input nodes:

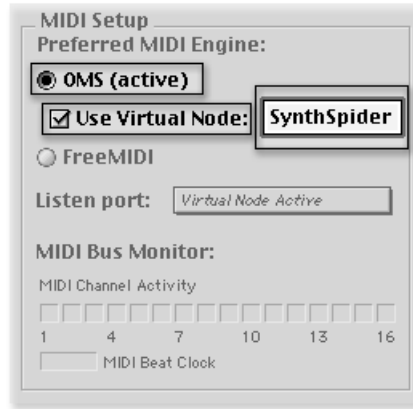


You must **unselect** the SynthSpider node in order to stop duplicated information from entering the node. By doing this, the SynthSpider node will be seen in a ProTools MIDI track as the following image shows:



#### 4.2.2) Using OMS with virtual nodes.

This mode allows SynthSpider to create its own virtual node whenever it's necessary. This way of using OMS is only recommended for ProTools version 5.1 or higher. To use OMS with Virtual Nodes you must select the "Use Virtual Node" option from the "System/MIDI" window inside SynthSpider (at the bottom of the Palette):



You can also choose the name you prefer, but we'll name it 'SynthSpider' for the examples in this manual.

Please note that the "Listen Port" menu is not active anymore, with a new text saying 'Virtual Node Active', because the virtual node is automatically detected, and you therefore don't have access to the rest of the system and other MIDI nodes. The connection to SynthSpider will depend on how the user sends data to the virtual node.



The appearance of the Output Devices menu in a MIDI track inside ProTools, after using the virtual node and removing the node created with the IAC driver is as follows:



Please note that in the virtual mode, a specific channel is established for Sync. This channel is for exclusive use of the MIDI beat clock for synchronization of the Sequencer modules. In the IAC mode, this functionality is available from the SynthSpider Device, created from the "IAC Buses" window.

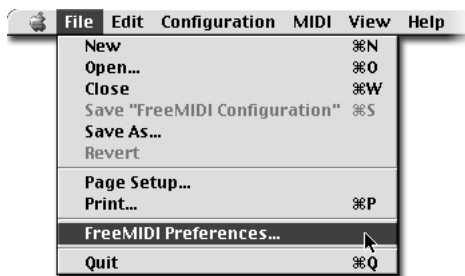
### 4.3) Configuring the software for FreeMIDI:

SynthSpider is compatible with Mark of the Unicorn's FreeMIDI using the 'Inter-application communication' mode. To configure it, you must acknowledge FreeMIDI that you will be using other applications.

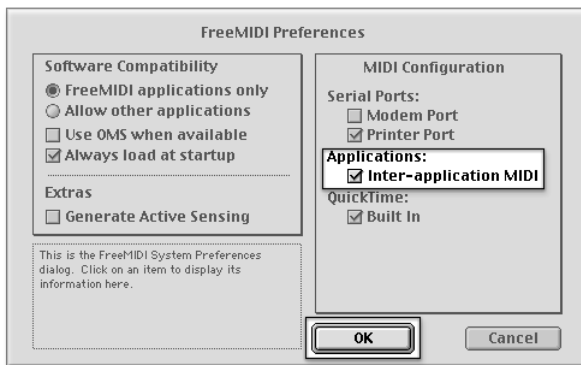
Locate FreeMIDI in your hard drive and double-click on the 'FreeMIDI Setup' application.



Select the "FreeMIDI Preferences" option from the "File" menu:



A dialog box will show you the following options:



The "Inter-application MIDI" option must be selected to use the SynthSpider node.

**IMPORTANT!: if you don't select the above option, SynthSpider will not be able to use FreeMIDI to communicate.**

Click the "OK" button.

You now have to configure SynthSpider to use FreeMIDI in the following way:

Open your FreeMIDI-compatible host program and make an instance of "SynthSpider Advanced" in any available track (it's irrelevant if you insert it in a mono track, a mono-stereo or a stereo-stereo track). Please locate the "System/MIDI" button at the bottom left of SynthSpider's main window:



Click on the 'System/MIDI' button. A dialog box will allow you to adjust the System values and the MIDI parameters you wish to use for SynthSpider. Among these parameters, the MIDI setup will also allow you to define the MIDI engine.



First you should select the preferred MIDI Engine to "FreeMIDI". In the event that OMS were already selected and were active in the moment of opening this window, click the OK button to know if FreeMIDI is available and if it can connect with that system.

Click the System/MIDI button once again, in the SynthSpider window.

Make sure the checkbox next to the word "FreeMIDI" indicates it's active, as shown in the dialog box. If so, the setup has been done successfully.

Now you can select a MIDI Device to which you can connect. Using the "Listen port" menu, you will see the available connectable MIDI nodes linkable from FreeMIDI. The usual procedure is to select the host program that deals with all the MIDI. In our case, as shown in the image of the dialog box, 'Digital Performer 2.72'. By selecting it, Digital Performer will allow you to make live connections from a MIDI keyboard with the Patch Thru option. This feature can be handled from Digital Performer's "Basics" dropdown menu:



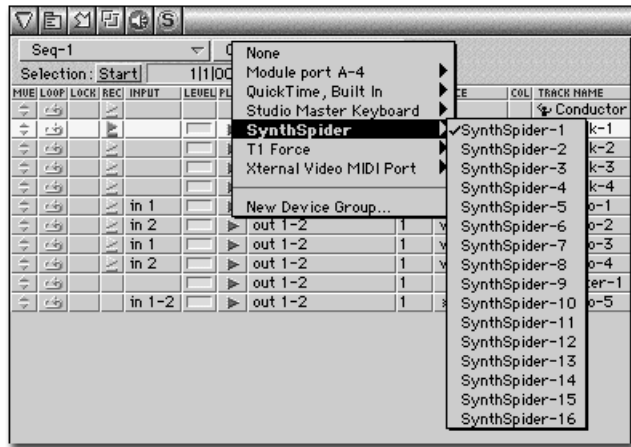
Once you have selected your option, Digital Performer will allow you to define the parameters and options for your Patch Thru mode:



The "Direct echo" and especially the "Auto channelize" options allow you to route data directly from each Digital Performer track to any instance of SynthSpider just by selecting the "Record Enable" icon.

However, SynthSpider may connect to any other MIDI node or device defined in the FreeMIDI configuration. Our example allows you to connect SynthSpider to the main keyboard in the studio, identified as "Studio Master Keyboard".

The image below shows the appearance of the MIDI Devices menu in Digital Performer when you try selecting a MIDI channel for SynthSpider as a recipient of MIDI information.



Please note that the existence of the SynthSpider "device" in the 'MIDI Devices' menu is limited to the existence or not of a SynthSpider instance. For this reason, the device may not be present until you insert the plug-in for the first time. Once you have inserted SynthSpider, the node will be referenced and memorized inside the document that contains the session.



## B) SynthSpider Description Guide

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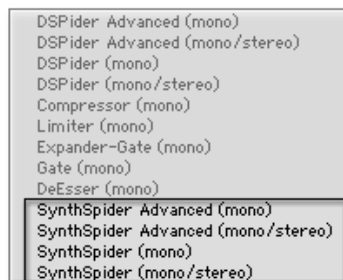
### 1) What is SynthSpider?

DUY SynthSpider is a two-level software component. One level connects the user to the software via the interface from the host program. This host program can be any that supports Digidesign's Audio Engine (DAE). The other level remains at a lower step and determines the digital processing functions. This level is invisible to the user and usually resides in the form of codes and algorithms inside the audio card with Motorola 56x00 processors.

SynthSpider allows both levels to be manipulated in such a way that the digital processing functions are determined by the user. Each one of these digital processing functions is enclosed inside a module. Each module can do a certain task. By combining the functions of several modules you can create an algorithm (a more complex task), built by interconnecting these modules.

The modules included in DUY SynthSpider have been especially designed to include functions related to the synthesis or generation of audio signals for musical use. It uses a modular design, and its source of information is MIDI.

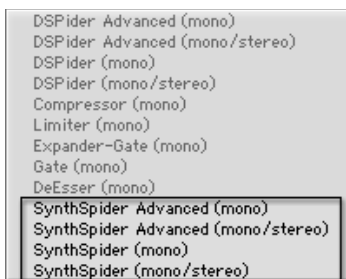
You can use DUY SynthSpider by choosing it from the Insertion section of a track in your host program. Depending on your host, the appearance and functionality of a track can vary. Considering Digidesign's ProTools for TDM, SynthSpider is available on Audio Tracks, Auxiliary Tracks and Master Tracks. Furthermore, each one of these tracks can be either in mono or stereo, and a mono track can also convert its output to stereo when you insert a Mono to Stereo insertion, causing the stereo splitting of the audio signal. These are the different kinds of instances you can find for SynthSpider on a Mono track:



As you can see, there are four different ways to insert SynthSpider. Those that include the word "Advanced" are instances that allow the user to create sounds with a large screen surface and greater editing options. The "non-advanced" instances allow you to load the patches (either the provided library or your self-created ones), and you can modify the sliders and some automation parameters.

SynthSpider allows the insertion of mono-mono, mono-stereo and stereo-stereo instances.

In a stereo track, you would be able to insert SynthSpider in the following different ways:

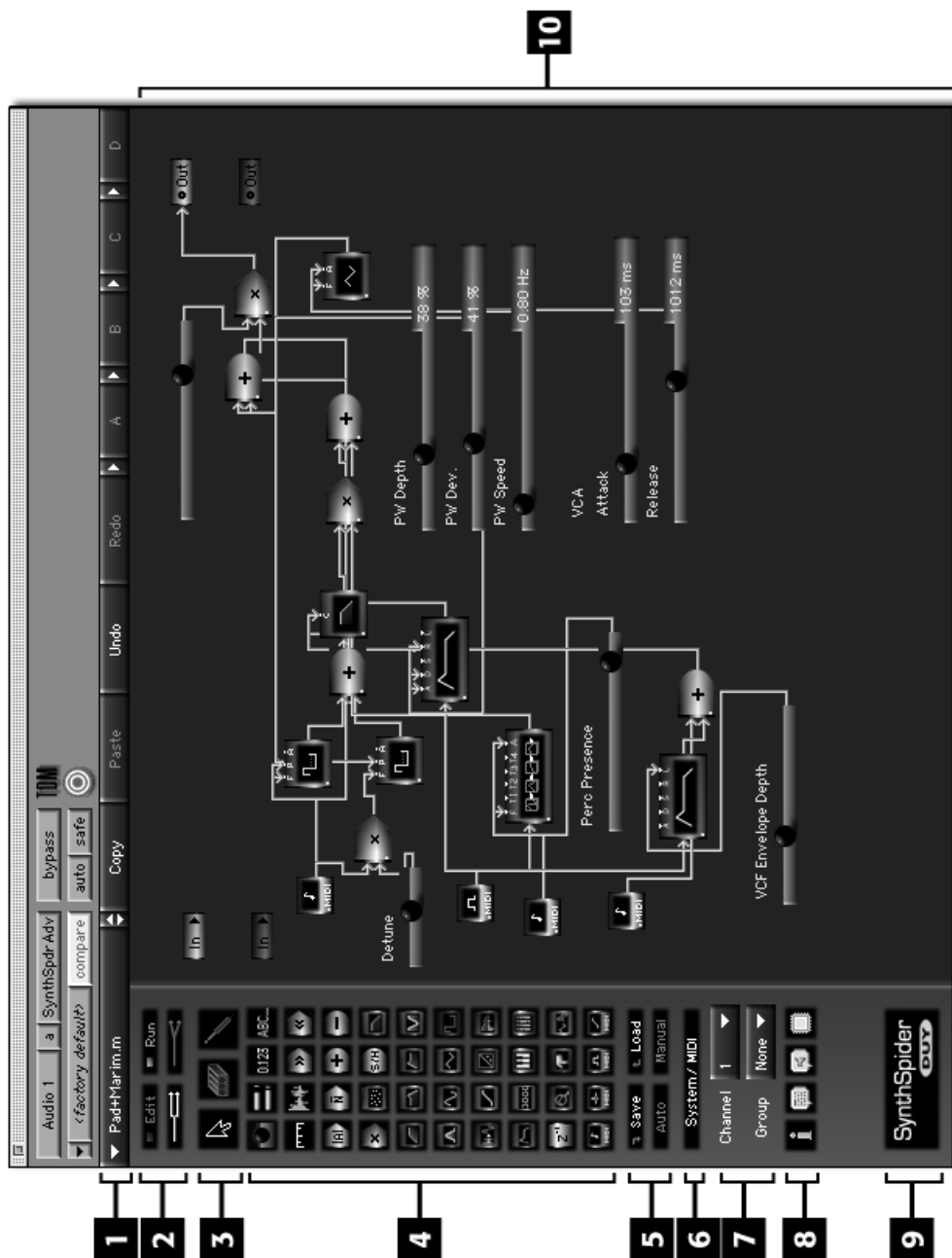


Although SynthSpider's main function is to generate sound, you can also use this software as an audio processor, with MIDI control if required. This is the reason why SynthSpider has a path for inputting signals (as you will see further on, SynthSpider has two "input" modules and two "output" modules which are the basis of the signal path).

## **2) DUY SynthSpider's Interface:**

SynthSpider's interface shows up when you insert it in a track, like any other plug-in. From this window you will be able to load, edit, modify, save or program your sounds or patches (we'll use the word "patches" and "presets" equally from now on). The interface also allows you to display the visual implementation of the algorithm of a certain sound by seeing the connections of the modules that form it. Let's take a closer look at each one of the parts of SynthSpider's interface:





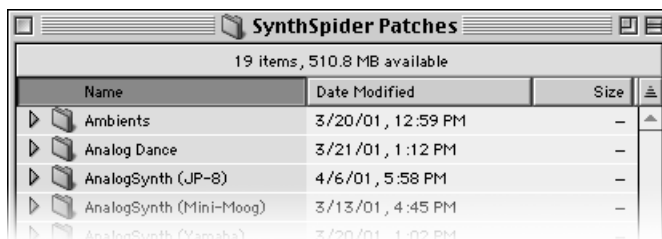
## 2.1) Edition Bar

### 1

The Edition Bar allows fast access to the presets and some other fast functions.

#### 2.1.1) Patch Manager Button:

The Patch Manager conducts the Patches or Presets files. When you install SynthSpider, the Patches are placed in a folder named "SynthSpider Patches", inside the same directory where the plug-in resides. This Patches folder includes several sub-folders which contain the presets classified in families:



The name of each one of these sub-folders will define the category of the patches included inside it. For example: Ambients, Analog Dance, Analog Synth (JP-8)...

Each preset is named with a suffix that indicates the kind of track insertion or situation it has been designed for. A preset called 'AnalogSynth.mix.m' has been designed to be inserted in a mono audio or auxiliary track (.m) and to be used on a MIX or MIX+ card (.mix)

These are the possible suffixes you will find:

- .m (mono output)
- .s (stereo output)
- .mm (mono input, mono output)
- .ms (mono input, stereo output)
- .ss (stereo input, stereo output)

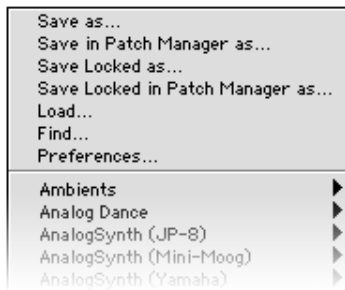
You can also find the following extensions in the event that the preset is not universal for any card:

- .mix (only usable on MIX and MIX+ cards)
- .pci (usable on PCI DSP farms).

Any change you make from the Finder on the Patch Manager directory and its contents will automatically affect the list of patches.



The button shown in the image above includes all the necessary information and functions for the management of patches. When you click on this button, a menu will be displayed, showing the list of available functions for the management of patches and below a line you will see the list of Patches families, ready to be loaded to use. On the right of the button (without clicking it) you can see two arrows (upwards and downwards). By clicking on them you can load the presets one by one based on their position inside the list.



- **Save as...**: This function saves the current patch with the possibility of changing the name and location on the hard disk.

- **Save in Patch Manager as...**: By choosing this option you will be doing exactly the same as in the "Save as" option, with the difference that the place where you save the patch will automatically be the root folder where all the active patches are located on your system. Once you save the document, the list of patches will automatically be rebuilt.

**IMPORTANT!:** If you save a patch in the Patch Manager, you might be altering the order and number of patches, in which case you may experience some trouble because a MIDI reference to a Patch change or Program change may load a different patch.

- **Save Locked as...**: Allows to save the active preset with the possibility of changing the name or location of the file on the disk. The format of the saved file will be blocked, which means that you will not be able to edit the algorithm (add or delete modules or connections), although you'll be

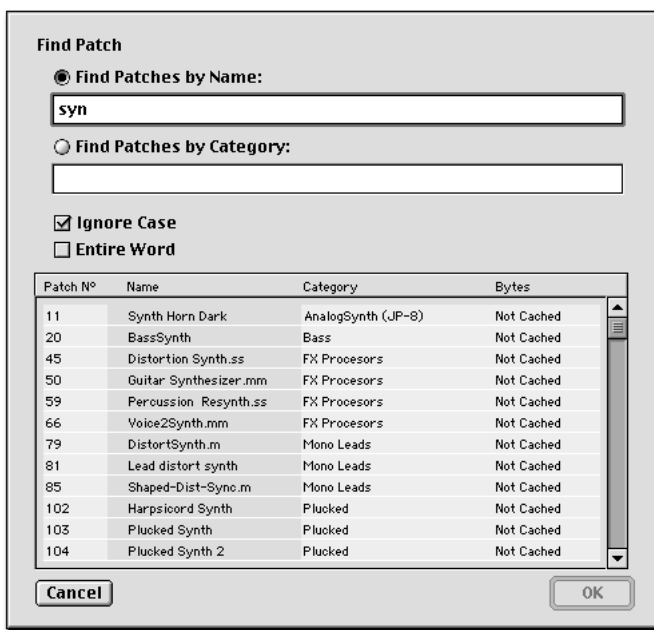
able to modify the values of the editable parameters for the existing algorithm. In conjunction with the change of visibility of the modules (See "hiding modules"), you can maintain the secrecy of your algorithm.

- **Save Locked in Patch Manager as...:** This option functions in exactly the same way as the "Save Locked as..." option, but the file will be placed in the predetermined root folder where SynthSpider's active patches are located. Once you've saved the file, the list of presets will be automatically rebuilt.

**IMPORTANT!:** By saving new presets you may be altering the order and number of patches. Therefore, if there's a MIDI reference to a change of patch or a Patch Change automation, the recall of the patch may not correspond to the one you had in the first place.

- **Load...:** Allows to manually locate a SynthSpider preset and load it.

- **Find...:** Helps you find presets installed in your system. A dialog box will appear with the following options:



The "Find Patch" dialog box is shown. It has two radio buttons: "Find Patches by Name:" (selected) and "Find Patches by Category:". Below the first radio button is a text input field containing "syn". Below the second radio button is an empty text input field. There are two checkboxes: "Ignore Case" (checked) and "Entire Word" (unchecked). Below these is a table with four columns: "Patch N°", "Name", "Category", and "Bytes". The table contains 12 rows of data. At the bottom are "Cancel" and "OK" buttons.

Patch N°	Name	Category	Bytes
11	Synth Horn Dark	AnalogSynth (JP-8)	Not Cached
20	BassSynth	Bass	Not Cached
45	Distortion Synth.ss	FX Processors	Not Cached
50	Guitar Synthesizer.mm	FX Processors	Not Cached
59	Percussion Resynth.ss	FX Processors	Not Cached
66	Voice2Synth.mm	FX Processors	Not Cached
79	DistortSynth.m	Mono Leads	Not Cached
81	Lead distort synth	Mono Leads	Not Cached
85	Shaped-Dist-Sync.m	Mono Leads	Not Cached
102	Harpsicord Synth	Plucked	Not Cached
103	Plucked Synth	Plucked	Not Cached
104	Plucked Synth 2	Plucked	Not Cached

You can search for patches using two different criteria: by name or by category, capital-sensitive or not, and searching for exact matches or parts of a word that identifies them.

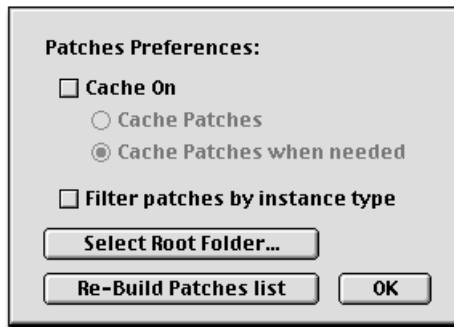
Whenever you type something in the text space provided to search by name or category, the list that appears below will be automatically refreshed, showing those presets that

match your Search Criteria. To select a patch from the resulting list, click on it and press "OK", or simply double-click on the name.

Other useful information is provided, such as the Patch ID number (corresponding to the MIDI Patch number), the category and the number of bytes of memory it's consuming (this option is only active when the Patches Cache is activated).

- **Preferences...**: This option will present a dialog box with the configuration options for the Patch Manager:

- The "Cache On" button allows to activate the loading of all the presets, avoiding the extra time it would take to read the patches from disk. This option depends on two other available options: "Cache Patches" and "Cache Patches when needed". In the first case, all the presets you have will be loaded when using SynthSpider for the first time in a session. In the second case, only the patches that are loaded during the session or required by the automation system will be loaded.
- "Filter Patches by instance type", determines the availability of a patch according to the kind of insertion it was programmed for: mono-mono, mono-stereo or stereo-stereo. For example: if we're using a stereo instance and we try loading a preset which is declared as mono-mono, the patch will not be available from the list of patches. From the practical side, you will see the name of the preset, but it will be displayed in light grey.
- "Select Root Folder...": allows you to choose the default folder from where the Patch Manager will start building the subfolders structure. The default folder when you install SynthSpider for the first time is called "SynthSpider Patches" and it's placed inside the same folder as the plug-in, (System Folder/DAE Folder/Plug-Ins). You can move it anywhere you like and select the root folder, which can be in any location inside your disk.
- "Re-Build Patches list": when clicked, it re-builds the list of patches/presets that will show up in SynthSpider. This is useful, for example, when you've just changed the location of the root folder or when the cache has been changed.



### 2.1.2) Edit Buttons (Copy, Paste, Undo, Redo):

These buttons are used for basic edition tasks. If the text is highlighted, you will be able to use the function, but not if it's in light grey. This would happen, for example, if you had nothing to paste, or no steps to undo.



The '**Copy**' button will copy the state of an entire screen (this includes the modules and connections, -the algorithms-, and each one of the values for the modules). However, it will not copy the general MIDI channel shown in the Palette, nor the Group to which the information belongs.

This information can then be pasted onto any other instance of SynthSpider with the '**Paste**' button.

The '**Undo**' and '**Redo**' buttons allow you to go backwards or forwards to the last setups you have had on your SynthSpider screen. There is a 10-state history. This means there are 10 levels of undoing and re-doing.

You can purge the entire contents of SynthSpider's private clipboard by clicking the 'Copy' button while holding the Option key.

### 2.1.3) Memory Buttons (A, B, C, D):



The A, B, C & D buttons represent temporary memories for several uses: you can use them to compare between different simple edition states, or you can use them to evaluate the difference between completely different presets.

By clicking on the arrow to the left of the letter, you will save the current settings to that letter's memory. To recall that setting, simply click on the letter button (A, B, C or D). Remember that you can use these memory utilities to save not only variations of one preset, but also a completely different preset (with totally different algorithms).

If you haven't saved any settings in one of the letters, they will appear greyed out to show you that the memory is empty. Temporary memories can be purged by clicking them while holding the Option key.

## 2.2) SynthSpider Visualization/Operation modes (Edit/Run, 90° View/Direct View)

### 2



### 2.2.1) Edit & Run modes:

"Run mode" is used to load presets and edit any of the visible parameters/values. This is the mode you're likely to be using during most of the time.

"Edit mode" allows you to work on the advanced edition capabilities of SynthSpider. You can program your own algorithms, change the position and look of the elements on the screen... You can only use this mode when you've made an insertion of "SynthSpider Advanced" when you selected the plug-in from the pop-up list.

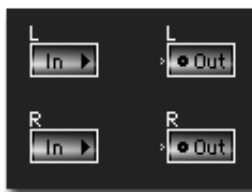
In Edit mode, you can see hidden modules and trace the connections between modules in a clearer way, thanks to the colour change of the connections between the selected modules.

Edit Mode shows some very important information.

In the case of a Slider module (see the Modules chapter for more information), you will observe a number at the top left of the module. This number indicates the slider number, which coincides with the one you can use when you automate the plug-in.



In Edit Mode you can also see the "L" and "R" (left and right) Bus identifiers on the Input and Output modules.



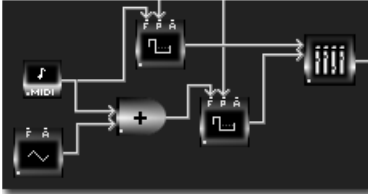
You can also see the order in which SynthSpider will calculate the algorithms while in the "Manual Mode" (see section 2.5 for further information). You can tell the order of calculation from the number that will appear at the bottom left side of each module, as shown below:



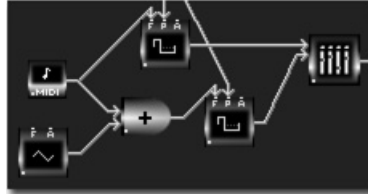
### 2.2.2) 90° View / Direct View:

When modules are interconnected, you will be using the "Patcher Tool", which will draw a line from one module to another. When you visualize these connections on the screen, you can choose any of the following modes:

- **90° View:** This option will draw the connections forming 90 degree lines.
- **Direct View** will draw straight direct lines from one module to another.



*90° View*



*Direct View*



## 2.3) Working Tools (Arrow, Eraser and Patch tool)

### 3



Three tools enable you to work with SynthSpider when you're in Edit mode. They are the Arrow, the Eraser and the Patcher. When you're using the Run Mode, you will only be able to use the Arrow tool.

#### 2.3.1) Arrow:

With the arrow selected, you can change any of the modules' parameters.

#### 2.3.2) Eraser:

This tool allows you to delete modules and connections between modules. To delete a module, you just have to click on the module while the Eraser tool is active. The only modules that cannot be deleted are the Input and Output modules.

To delete a connection between two or more modules you can proceed in two different ways:

- Click on the connection while the Eraser Tool is selected (highlighted). It may seem absurd to point this out, but sometimes you have many connections on your screen, and it's hard to see if the connection you have clicked on is really the one you wanted to delete. This is why we have implemented an additional system to make it easier for you to see how you're dealing with deleting connections:
- With the Eraser tool active, click and keep the mouse clicked while the mouse pointer is over a connection. The connection you're pointing at will start blinking in blue if it's an audio connection and in yellow if it's a control connection. Once you have found the correct connection to delete, lift the mouse button to stop clicking and the chosen connection will be deleted.

### 2.3.3) Patcher:

The Patcher is used to interconnect modules. You must always connect modules from the origin to the destination. Therefore, from the output of a module to the input of a module. This input can either be an audio signal or a control (according to your algorithm's needs).

To draw a connection, click on the inside of a module that has an output and hold the mouse until you reach the input connection you're aiming at, where you should lift the mouse button. There's a "hot zone" near any inputs of a module, which means there isn't an EXACT point where you have to lift the button of the mouse, because SynthSpider detects the area near an input.

In general, when you point at the destination of a connection and you're about to lift the button of the mouse, please consider that the mouse should be pointing at the connection INSIDE the module, and not near the green arrow outside of the module.

There are three interesting functions that the Patcher tool provides:

- While operating in Manual Mode (see section 2.5) you will be able to sequentially assign a new order of calculation to a module by double-clicking on a module with the Patcher tool.
- Also in Manual Mode, if you double-click on the Patcher tool icon, you will reset to zero all the levels of calculation for your modules.
- With the Patcher active, you can automatically assign a slider with its numeric readout value display, totally connected, by clicking on the "hotzone" of the control of a certain module while holding the Command key. If you can't see it happen, please make sure the Patcher tool is active.

## 2.4) Modules

### 4

SynthSpider has 40 modules, which have different functionalities. They are explained in depth in chapter C of this manual

To insert a module on the working surface of SynthSpider, at the right of the screen, SynthSpider takes advantage of the "Drag and Drop" technique. Click on the module and hold while you drag the module to an empty area of the working surface. Let the mouse button go, and the module will be placed.

If you hold the Option key when you release the mouse button, a window will popup to show the internal options for that module (if available).

If you hold the Cmd key while you're dragging the module, a snap grid will be active, to let the modules be aligned better on the screen.



## 2.5) Save/Load and Auto/Manual

### 5



The **"Save"** and **"Load"** buttons are the quickest way to save and load a SynthSpider preset or patch. However, you have many more Save and Load options in the Patch Manager bar at the top of the screen.

The **"Auto"** and **"Manual"** buttons determine the order of calculation of the functions of each module in an algorithm.

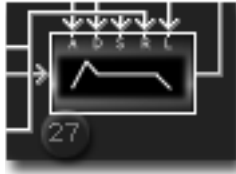
In Automatic mode, the order is calculated according to the hierarchical position of the module in the connections chain, which is analyzed from the input module to the output module.

**Is the order of calculation really important?** If you have connections with feedback, where the result of the calculation of a module depends on the result of a module that's placed after the first module, the answer is YES. If you design expert filters, it's strictly compulsory to execute the feedback cycles in a stated order.

Once you have an algorithm, if you want to assign the order of each one of the modules from scratch, you should follow these steps:

- Click on the Edit button.
- Click on the "Manual" button.
- Double-click on the Patcher tool to reset all the modules to zero.
- You can now start to double-click on each module sequentially following the order you want for the calculation.

In Manual mode, the order of calculation for a module appears on the bottom left hand side of each module.



2.6) System/MIDI

6

The System/MIDI button allows you to define the tuning, syncing, voicing, MIDI operations and MIDI nodes connections.



By clicking on the button, a complete dialog window will appear:

System Settings

Master Tune:

☐

440.00 Hz

Master Clock

☐

140 bpm

☐ Sync to MIDI beat Clock

Reset MIDI

MIDI Setup

Preferred MIDI Engine:

☒ OMS (active)

☐ Use Virtual Node: SynthSpider

☐ FreeMIDI

Listen port:

SynthSpider

MIDI Bus Monitor:

MIDI Channel Activity

1

4

7

10

13

16

☐ MIDI Beat Clock

Voice Management

Cha	Mode:	Multi Trigger		Stole	Prog. Change
		On	Off		
1	Mono	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2	Mono	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
3	Mono	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
4	Mono	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
5	Mono	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
6	Mono	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
7	Poly 3 (Rotative)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
8	Poly 3 (Rotative)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
9	Poly 3 (Rotative)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
10	Mono	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
11	Mono	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
12	Mono	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
13	Mono	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
14	Mono	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
15	Mono	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
16	Mono	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

OK

### 2.6.1) System Settings

The System Settings section allows you to choose the tuning of the A4 note. This is SynthSpider's universal tuning control.



You can choose the master clock value in bpm (beats per minute). This value can be overwritten in each sequencer module, because it can use its own clock (see the Modules chapter).

A button is also provided to use an external clock fed via MIDI Beat Clock, in which case any object synchronized to SynthSpider's Master Clock would use the external reference.

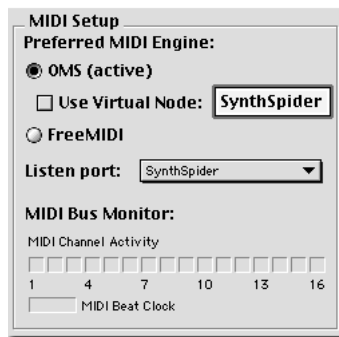
The "Reset MIDI" button is used to clean the global MIDI settings within SynthSpider, so all notes would stop being active, and all MIDI controller states would be cleaned as well.

### 2.6.2) MIDI Setup

This section of the System/MIDI screen allows you to select the MIDI System you want to use with SynthSpider.

This product supports Mark of the Unicorn's FreeMIDI and Opcode's OMS (Open MIDI System) as communication protocols between MIDI devices connected to your computer.

To select your favourite system, select any of these two types. Once you have done this, the word "active" will appear next to the system you're using.



If you choose to use OMS, we provide a button that allows you to use SynthSpider in the "Virtual Node" mode. In this case, you can choose the name for your node (type whichever you prefer, although we suggest 'SynthSpider' as in the example). Don't use the name of another virtual node or device being used at present.

Section "A" of this manual explains how to setup the MIDI options.

At the bottom of the "MIDI Setup" there's a monitoring system that allows you to visualize the MIDI information in each channel, plus the MIDI clock. In the case of channel information, you will see red lights, whereas the clock will show yellow lights.

### 2.6.3) Voice Management and MIDI Architecture

MIDI implementation and the functional structures that accompany it (modules, channels, voices and groups) are modular and user-definable within SynthSpider. This implies that SynthSpider has different behaviours according to how it has been inserted and to how you configure the Voices options.

SynthSpider can function on 16 MIDI channels. It's possible to have multiple instances selected on the same MIDI channel.

Each MIDI channel has 4 different kinds of behaviours (one monophonic and 3 polyphonic), with several Trigger options. The number of voices is dynamic and it will depend on how many instances of SynthSpider you have and how you have inserted them.

Each SynthSpider insertion can listen to one or several MIDI channels and will represent one voice in the worst case, although it's possible that one unique instance can listen to more than one channel at the same time, in which case one instance can have more than one voice.

The number of voices is determined according to the number of insertions of SynthSpider connected to a same channel. For instance: you can create a session in your sequencer and insert 4 instances of SynthSpider. Three of them will use MIDI channel 7 and the other will use channel 2. In this configuration, you have 3 voices for channel 7 and one for MIDI channel 2.

If you configure MIDI Channel 7 to be in the Rotative mode (Polyphonic mode 3), you will have 3 polyphonic voices. However, if the channel is configured to function in a Monophonic mode, the three instances would behave as one only voice and three simultaneous sounds would be played with each keystroke. The instance on channel 2 would be a totally independent monophonic voice.

Voice Management							
Cha	Mode:	Multi Trigger		Stole		Prog. Change	
		On	Off	On-Rtn-Vel			
1	Mono	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
2	Mono	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
3	Mono	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
4	Mono	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
5	Mono	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
6	Mono	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
7	Poly 3 (Rotative)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
8	Poly 3 (Rotative)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
9	Poly 3 (Rotative)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
10	Mono	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
11	Mono	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
12	Mono	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
13	Mono	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
14	Mono	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
15	Mono	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
16	Mono	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

Each MIDI Channel can function in one operational mode, with Multi-trigger options, stolen notes behaviour and the ability of a MIDI Program change control.

SynthSpider has 4 operative modes to manage voices:

- Mono
- Poly 1 (First Note)
- Poly 2 (Last Note)
- Poly 3 (Rotative)

☒ Mono  
☐ Poly 1 (First Note)  
☐ Poly 2 (Last Note)  
☐ Poly 3 (Rotative)



- **Mono mode:** The monophonic mode only allows you to have one voice, but memorizes all the notes that correspond to the keys that are pressed on a keyboard or recorded in a MIDI track, so that the accumulated notes will be played when the first note you started playing has been released. For this to occur, you must establish the Multi-Trigger options.
- **Poly 1 Mode ("First Note"):** In this mode, voices are assigned according to the order in which you play the notes. The second priority of this mode is to keep voices as aligned as possible to notes, meaning that it will try to preserve the last note used by that voice. This algorithm is optimised to correspond to the Piano-playing technique, or similar to other instruments with long releases, whose sound endings must not be cut with new keystrokes.
- **Poly 2 Mode ("Last Note"):** If this mode is active, SynthSpider will try to use the same voice used without giving priority to the executed note. Therefore, there's priority for the last note. This is exactly the opposite to Poly 1 Mode. It's very effective on polyphonic sounds with portamentos, where the execution of the note follows the variation of pitch due to the portamento.
- **Poly 3 Mode ("Rotative"):** Voices are assigned in a rotative way. Each new keystroke will use a new voice, although it's the same note. This was the most popular algorithm in the first days of polyphonic synthesizers. It's especially interesting when used together with the extreme panning of voices, where every new voice can appear in the mix in different aural positions.

In Monophonic mode you can control the MIDI Gate Trigger system by making it trigger every Note ON with the option of MultiTrigger ON. You can also trigger optionally with the notes OFF if you want to activate the MultiTrigger Off. This would mean that when you stop pressing the key you would be activating the envelope generators if there were more than one note pressed.

You can also program "stolen notes" within SynthSpider. One note is "stolen" when the user has used more voices than permitted and needs an additional note. You can activate the "stolen notes" option by choosing the **"STOLE ON"** option. Once you have stolen the note, the previous one isn't played, but it can be re-activated if any note is freed (you can do this by activating the **"STOLE RTN"** option. You can also choose if you want to use the velocity value of the original or the last note you played, by checking on the **"STOLE VEL"** option. This last option can cause abrupt control changes (according to how you use the velocity information inside the preset/patch). For example: if you're controlling volume, using the original velocity of the stolen note can cause a sudden change in the intensity of the voice, which can be intentional or not. You can always smooten it with a ramp control.

MIDI Program Changes can be disabled with the "Prog. Change" button. The Program Change commands are linked to the information in the Patch Manager.

**IMPORTANT!: MIDI Program Changes for SynthSpider may not be available for some DAE-aware applications.**

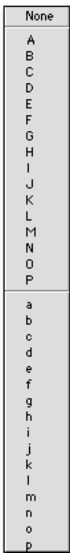
## 2.7) MIDI Channel/ Group

# 7



The MIDI Channel menu allows you to set the MIDI channel that the instance must listen to.

You can choose any of the 16 channels. There is also a "Multi-channel" option, which uses the internal MIDI channel of each module individually. This allows you to use more than one MIDI channel in one instance of SynthSpider. However, it's advisable to use one MIDI channel per instance, given the complication of routing the MIDI information, which could lead to confusing behaviour.



The grouping system allows you to categorize instances in groups, for ease of use.

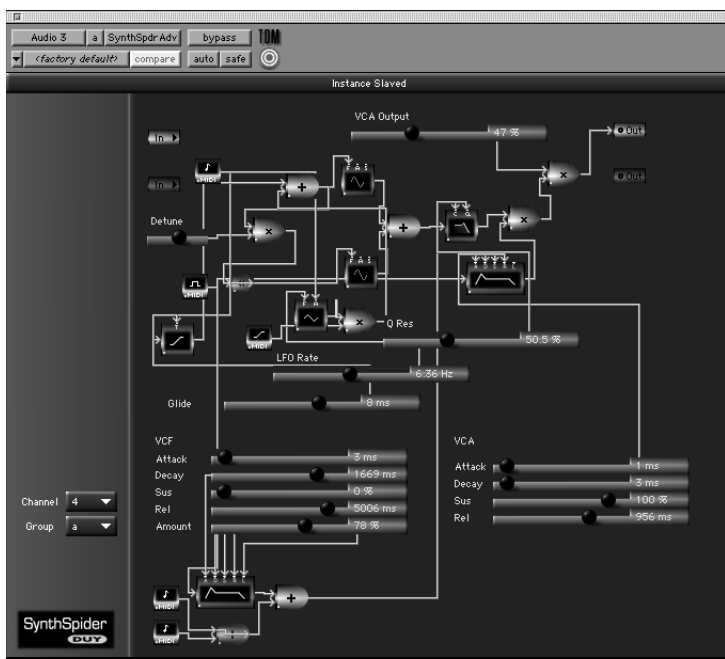
You have 16 main groups, called "Master Groups", which have been named with capital letters between A and P, and their "Slaves" from "a" to "p" (lowercase):

A Master group is a unique instance with as many slaves as you like.

You can edit and automate any parameter on a Master Group. Any slave instance will clone all the information exactly in the same way as in the Master Group, except for the MIDI channel.

To create a Master Group simply select any capital letter from A to P from the Group button. You can create the slave by choosing a letter from "a" to "p".

What's the use of having a master group with slaves? Imagine you want a 4-voice pad sound. To simplify the programming of 4 different instances, you can create one Master instance on the first SynthSpider instance, and let the other 3 instances be associated to the first group. The appearance of the cloned instances will change (the majority of the objects on the Palette, at the left of the screen, will disappear). The MIDI channel selector will still be available (see image on next page).



Please note that changes on any slave instance will be changed on the Master, but no editions will be possible. All editions shall be made from the master instance.

## 2.8) Information, help and DSP Preferences

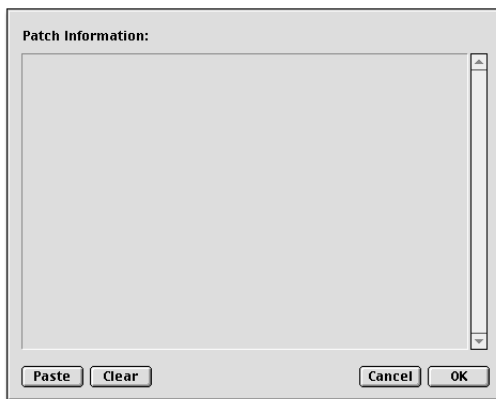
### 8

#### 2.8.1) Patch Information



The yellow button with an "i" opens a window with information related to the patch you have loaded. This information is normally provided by the person who programmed the preset and it contains information related to the uses of that patch and its possible uses.

To write information in this box for the first time (it's the only time you can do this), you must save the patch document, go to Edit mode and paste the information inside the dialog box.



This window only allows you to paste and clear, but never edit text, so we advise you to write the information on a text editor and then paste it. The Paste and Clear buttons are only available in Edit mode.

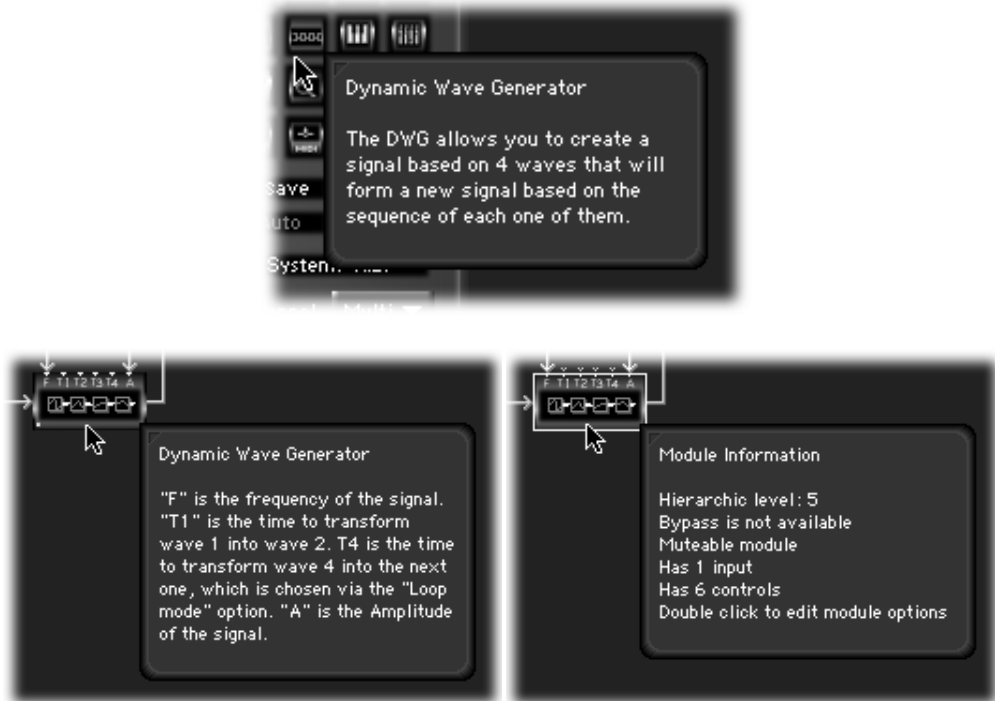
## 2.8.2) Help

SynthSpider offers 2 different types of online help. One of them is Help Ballons. The other is thanks to spoken help, which is available when the Speech Manager is active in your system.

To activate the Help balloons, please click on the second icon from the left.

These help balloons will display different information according to the mode you're in (Edit or Run) and depending on where the module is situated (if you point at the module on the palette or already on the working surface at the right of the screen).

Let's see an example of the different displays the Help balloons according to the position of the modules on which we request the information:



A very helpful shortcut allows you to activate the help balloons for a moment. To do this, hold the Shift key and point at an object (without clicking).

### 2.8.3) DSP allocation preferences

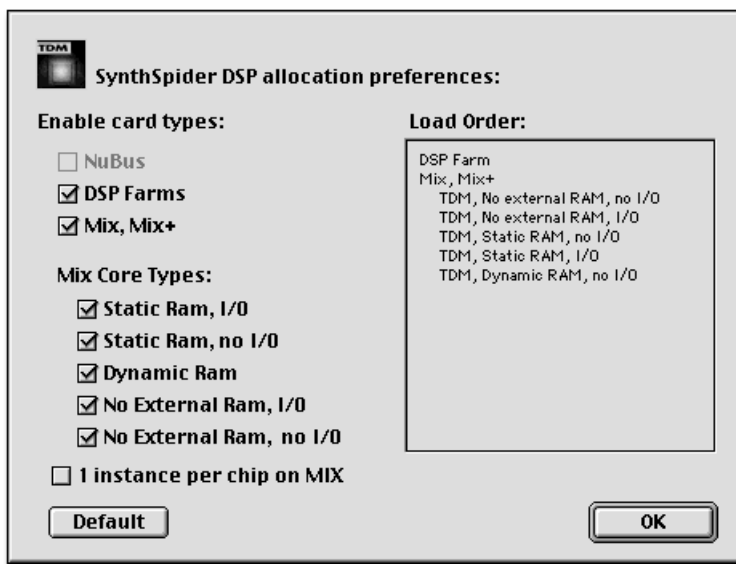
The last icon in this row allows you to configure the DSP allocation preferences within SynthSpider.

**IMPORTANT!:** These preferences change the behaviour in use of the DSP. If you're not sure which option to use, please don't modify the contents of the pre-assigned values on this page.

By changing these values you can change the behaviour of DAE when looking for available resources inside the DSP cards. Certain kinds of cards can be enabled or disabled.

Please consider that, although DSP farms are not supported in the system requirements, it's possible that their functioning is enabled in certain versions.

You can also enable or disable certain kinds of chips inside a certain card. You can also force to use only one instance per chip inside a MIX or MIX+ card even on cards that have enough memory to have more than one instance per chip.



The order of preference is programmable and it's listed on the right hand side of the screen. To create a new preference in the order of use, you must disable all the options and start too enable them in the desired order.

The "default" button will return all values to the standard default.

## 2.9) The Logo

### 9

By clicking on the logo, you will see information on a new window.



Opt-Click will show additional credits.

Ctrl-Opt-Cmd+Click will activate a small visual surprise.

## 2.10) “Working surface”

### 10

As you will have seen written several times in this manual, we have been making constant reference to the "working surface". This is the best name we have found to call the area on the right hand side of the screen, where the user can drag modules to create the algorithms.

There are two different screen sizes within SynthSpider. When you insert "SynthSpider Advanced", a larger screen is created, where as the normal insertion will show a smaller screen.

The Advanced mode is required to program and edit patches. The only edition capabilities within the simplified mode are restricted to changing slider values.

The reason for having two modes is to optimize the use and size of the screen according to the needs. The simpler mode is normally used to load the presets.

When you're in Edit mode, within the Advanced mode, you can see a dotted line half way up in the SynthSpider screen. This is exactly the size of a non-advanced instance. Anything you want to see in the non-advanced instance (when you load and read a patch), should be placed inside this area.

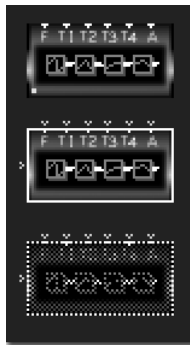




## C) SynthSpider Module Description.

### Preliminary: About the modules.

Each SynthSpider module has a certain function. Modules are identified by their appearance, which can be visualized in two working modes: Edit and Run. They look different according to which working mode you're in. In the next figure you can see the same module in Run and Edit modes (the third image shows a hidden-state module in Edit Mode).



Modules may have "hot zones" for certain functions such as resizing, opening the Options window or connecting modules.



The "hotzone" is an active area near a possible connection, where you can release the patcher tool when connecting to that input control.

The resizing zones are used to change the size of some modules.

The Option zones allow fast access to the options of the module (if any). This area is identified by a small white dot at the bottom left of a module. By clicking on that zone in Run Mode, you'll be able to visualize the options for that module.

Rules for interconnecting modules:

- All modules can be "connected to" or "connected from", except for the Sequencer module.
- All modules have outputs, except for the OUTPUT BUS modules, which end the connection routing.
- All modules can have an unlimited number of outputs, with the exception of the BUS output modules, which don't have any outputs.
- Not all modules have got inputs and outputs.

## Module states

Some modules can be Bypassed:



The Bypass state will place at the output of the module the signal that was at entered at the input (see image for visualization). If the module has more than one input, the bypass will be selectable at the input in a circular way. To change a module to its Bypass state, click on it in Run Mode.

Some modules can also be Muted:



When a module is Muted, the output will have no audio signal. To mute a module, Cmd+Click on the module while in Run Mode. You will see a cross on the module, which will be faded on the screen.

Modules can be hidden so they can't be seen in Run Mode. However, you will continue to see them in Edit Mode in order to continue doing to appropriate editions. To hide a module, you just have to Opt+Click on the module in Edit Mode, with the Arrow tool. To make it visible again, repeat the procedure.

To make all the hidden modules visible simultaneously, double-click on the Arrow tool while in Edit Mode.

## 1- SLIDER

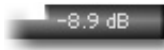
Number of instances: 16

Inputs: 0

Controls: 0

Bypass: no

Mute: no



A slider generates a digital value proportional to its position. It can be used to generate control settings for most of the functions available to the user (in non-advanced mode) and also to generate constants, generally not available to the user. This is made possible by the multiple programmable parameters available in Edit Mode. You can see the module's options by double-clicking on the module in Edit Mode. A dialog box with several settings will appear:



On the right side of the box you can set four values:

**Minimum:** this is the value your slider will reach in Run Mode when it is totally to the left horizontally or completely down when being used in a vertical position.

**Maximum:** The value assigned when the slider is completely to the right in Run Mode (or at the highest position if the slider is oriented vertically). It is important for you to bear in mind that the

Minimum value will always correspond to the left of the slider (or down vertically) even if the entered minimum value is higher than the maximum. Therefore, you can set a lower value for the Maximum than for the Minimum, in which case you would have the smaller value at the right (or at the top according to the orientation).

**Current:** This indicates the last value the slider was set to when you last quit Run Mode. If you change it, the new settings will apply.

**Default:** This is the value the slider will be set to in Run Mode when you hold the Opt key and click on the slider.

On the left, a list of nine different units allows you to choose the format of the visualized values on your slider: dB, Float, percent, integer, Hex, Hertz, mili-seconds, Mili-seconds (AR) and mili-seconds (2 pole filter). It is important to bear in mind that changes to any of the preceding units will not produce any change in the output value of the slider, except in those cases where the range of values is not allowed for the selected unit.

If you insert values in a certain mode (dB, for instance) and then switch units to percentage, DSPider converts the values to the new scale. It is very important that you consider the valid ranges for each unit, as the conversion could lead to mistakes. For example if you set a float value to -4 (minus four) and then switch to the dB mode, the conversion will not be done properly, as the logarithm of a negative number does not exist.

Let's look at another example: a 0 dB value (in the dB scale) will change to 100% when switching the units to "%" (percentage). This represents the maximum digital output. If you change to -6.02 dB, the value in "%" will change to 50%, as it means the signal value is reduced by half in linear terms.

### The available units for sliders are:

**dB:** this format ranges from the "-INF" value to 0 dB. You must consider that you can not enter a superior value than 0 dB (maximum positive output value). Also in this mode you can not output negative values because the minimum value, which is -INF produces a 0 output.

**float:** values range between -1 and 1. It allows the full range of output values.

**%:** it allows you to set a relative value (percentage). Ranges from -100% to 100%. It allows the full range of output values.

**Dec:** values range from -8.388.607 to 8.388.607. It allows the full range of output values.

**Hex:** values range from FF800001 to 7FFFFFFF (hexadecimal numbers), which allow the

full range of 32-bit output values, considering that only the least significant 24 bits will be used inside the DSP.

**Hertz:** The values range from  $-S/2$  to  $S/2$ ,  $S$  being the sampling frequency of the project. For a sampling frequency of 44.100 the range is -22.050 to 22.050. It allows the full range of output values. Choose this option to control the frequency of the oscillators. It allows the full range of output values. However, to control oscillators you can't use negative values. Do not use this unit for controlling filters, as a different unit was created for this purpose.

**Mili-seconds:** This mode was designed to have a delay reference and gives a direct conversion from samples (if set in Integer mode) to mili-seconds. The values range from  $-8.388.607/S$  to  $8.388.607/S$ , where  $S$  is the sampling frequency in KHz. For a 44.1 KHz sampling frequency the range will be -190.217 to 190.217 seconds.

**Mili-seconds (AR):** This unit is used to control the attack and release values of envelope followers and ramp generators. Although negative values are allowed, they are not useful for controlling attack and release parameters. The practical values range from INF to  $1/S$ ,  $S$  being the sampling rate in KHz. For a sampling rate of 44.1 KHz the range will be INF to 0.022676 ms. Please refer to modules 26 and 28 for more details (Ramp generator and Envelope follower modules).

**Hertz (2 Pole Filters):** Choose this option to control the frequency of the two pole filters (modules 18 to 21). The values range from -7577.3 to 7577.3 Hz. We advise you only to use positive values to control filters. The useful range is 20 to 7577.3 Hz. Do not use this unit for controlling oscillators.

**BPM (Beats per Second):** This unit is used to control the low frequency of oscillators measured in beats per seconds.

The **Tracking** option allows you to select the curve that relates the output values to the slider position when using the slider in Run mode. You can choose between three different options: **Linear**, **dB** and **AR**. Linear and dB are self explanatory. The AR option is optimized for controlling attack and release times.

The **Templates** section provides a fast way to set all the Slider Options values for most typical uses. The predefined templates are: Gain, Filter, Oscillator, LFO, AR (Attack and Release), and Short, Medium and Long delays.

When using the slider in Run or non-advanced Mode, you can fine-tune when choosing a value with the slider by pressing Cmd while changing the value on the slider with the mouse.

## 2- PLASMA METERS

---

Number of instances: 16

Inputs: 1

Controls: 0

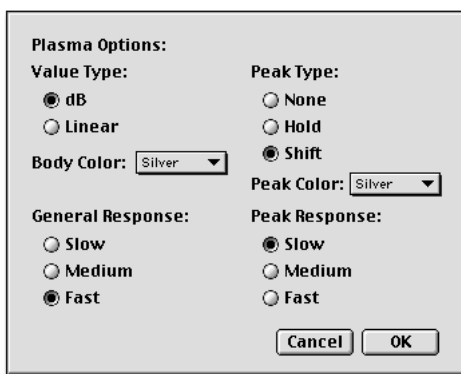
Bypass: no

Mute: no



Plasma meters are high-resolution bargraph displays with a peak and hold option.

Several parameters can be edited by double clicking on the module in Edit Mode. Value type allows dB and linear scale responses. The dB scale is the most usual for audio signals, although you can also use a linear display. There are three different speeds of response: slow, medium and fast.



You can also have a peak display on the plasma meter, which is a small mark on the maximum achieved value. You can choose between three different modes:

**None:** does not display a peak value.

**Hold:** displays and holds the maximum value during a period determined by the Peak Response time: slow, medium or fast.

**Shift:** displaces (moves) the peak display according to the peak signal, and then falls more slowly with speed defined by the Peak Response time: slow, medium or fast.

Both the bargraph and the peak display have different color options: blue, silver, magenta, red, yellow and green.

Plasma meters are usually combined with a scale module, although this is not obligatory.

### 3- NUMERIC READOUT

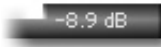
Number of instances: 32

Inputs: 1

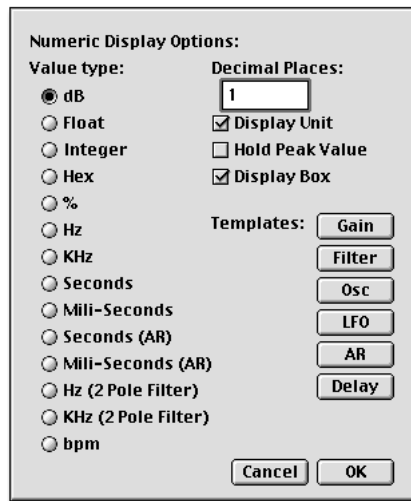
Controls: 0

Bypass: no

Mute: no



This module is used to display values in a numeric form. When editing (double click on the module in Edit Mode) you can choose the units which will be used for display: dB, Float, Integer, Hex, %, Hz, kHz, Seconds, Mili-Seconds, Seconds (AR), Hz (2 Pole Filter) and KHz (2 Pole Filter). The ranges of these units are equivalent to the ones explained in the Slider module section.



**dB:** Displays values in decibels (range from "-INF" to 0 dB). Please note that values above 0 dB are not allowed.

**float:** values are float numbers ranging from -1 to 1.

**integer:** displays values as integer numbers ranging from -8.388.607 to 8.388.607.

**Hex:** displays hexadecimal values ranging from FF800001 to 7FFFFFFF. It allows the full range of output values.

**%:** it allows you to visualize a relative value (percentage). It ranges from -100% to 100%.

**Hertz:** choose this option to read the frequency of oscillators. This is not a suitable option

for filters. Values range from -22050 to 22050. However for oscillators you will not use negative values.

**KHz:** Used in the same way as the Hertz option, it displays frequency in kilohertz.

**Seconds:** This mode was designed for the delay modules. It gives a direct reading in seconds.

**Mili-seconds:** This mode was designed for the delay modules. It gives a direct reading in mili-seconds.

**Seconds (AR):** This unit is used to measure the attack and release values of envelope followers and slope modules. It gives a direct reading in seconds.

**Mili-seconds (AR):** Also measures the attack and release values of envelope followers and slope modules. It gives a direct reading in mili-seconds.

**Hertz (2 Pole Filter):** Choose this option to visualize the frequency of the 2 pole filters (modules 18 to 21). You can also optionally control 1 pole filters (modules 16 and 17).

**Kilohertz (2 Pole Filter):** The same as the previous option but scaled in kilohertz.

You have even more visualization options:

**Decimal Places:** You can select the number of decimal places you want the readout to display and thus the precision of the reading. In the "fine mode" (Cmd-drag) the graphical resolution also depends on this setting. If you had a -32 dB value to display and you chose a dB type with 2 decimal places you would visualize "-32.00 dB" to "-32.99" on the display box, therefore increasing the resolution. In this case the readings would be in steps of 0.01.

**Display unit:** It allows you to display the unit (dB, float, Hz and so on) next to the value when in Run Mode.

**Hold Peak Value:** the readout displays the maximum value reading. If you choose this option, you may want to reset the counter to find a new peak value when you're working in Run Mode (or in Non-advanced Mode). To do so, simply click the module in Run Mode.

**Display box:** select if you want to see a small box enclosing the measured value.

**Templates:** As with the Slider module the Templates section provides a fast way to set all the Plasma Meter Options providing the most typical settings for certain uses. The predefined templates are: Gain, Filter, Oscillator, LFO, AR (Attack and release), and Delays.

It is important to note that the numeric readouts can not be patched from any module output. In fact they can only be patched from a Slider module and to a Plasma Meter.

If you need to patch a numeric Readout to another kind of module we recommend inserting one Plasma Meter as a bridge.



## 4- TEXT LABELS

---

Number of instances: infinite

Inputs: 0

Controls: 0

Bypass: no

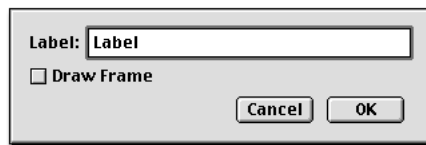
Mute: no



To insert a text label, simply drag the module onto the blackboard and double click in Edit Mode. Insert the text into the dialog box and you will be able to visualize it when you go back to Run Mode. We advise you to label all the patches you create as well as some of the modifiable parameters to keep a good record of all the controls you create on your DSPider patch.

You can also draw squares in order to enclose specific areas of the blackboard. These squares can also have text in them.

To create a square make sure you are in Edit Mode. First, double click on the module, write a text if you wish, and activate the Draw Frame option. Press OK. Still in Edit Mode, you will see a red or white small square on the lower right corner of the label box. By clicking and holding while dragging you can enlarge the surface to which the label is extended. The labelled square will be present in Run mode.



## 5- SCALES

---

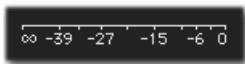
Number of instances: infinite

Inputs: 0

Controls: 0

Bypass: no

Mute: no



Scales are usually used to give a dimension and quantify plasma meter readings. You can change the scale type by double clicking on the module.



There are four different options:

**dB**

**linear**

?: percentage

**no scale**: allows the user to label the scale he prefers at his convenience, by inserting a text label above or below the scale display.

You can also select:

- the number of divisions on the graphic scales
- the decimal precision. Example: set it to '2' to visualize a 3 dB value as 3.00 dB.

## 6- SCOPES

---

Number of instances: 4

Inputs: 1

Controls: 0

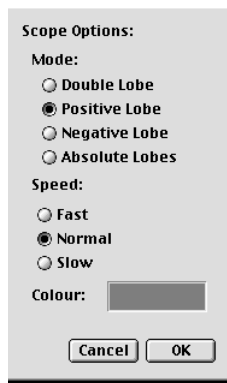
Bypass: no

Mute: no



The scope is a low frequency oscilloscope used to visualize the evolution in time of a signal. Signals can be either audio or control. The signal appears from the right side of the screen and moves towards the left.

If you enter the dialog box by double clicking on the module in Edit Mode, you will be able to choose between four possible modes:

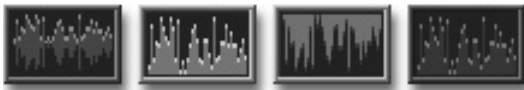


**Double Lobe:** Displays on the scope both the positive and negative values.

**Positive Lobe:** Only displays positive values.

**Negative Lobe:** Only displays negative values.

**Absolute Lobe:** Displays positive values as positive but converts negative values to positive.



You can also choose the signal speed on the screen (Fast, Normal or Slow).

Finally, you can select a color for your display. Click on the predefined color and another dialog box will appear allowing you to modify the color.

When you are visualizing the signal (and therefore using the Non-advanced Mode or Run Mode), you can:

- Reset the screen and clean it, by double clicking on it.

- Hold the display on the screen, by clicking on it and holding.

## 7- SHIFT RIGHT

---

Number of instances: 12 in total together with shift left modules

Inputs: 1

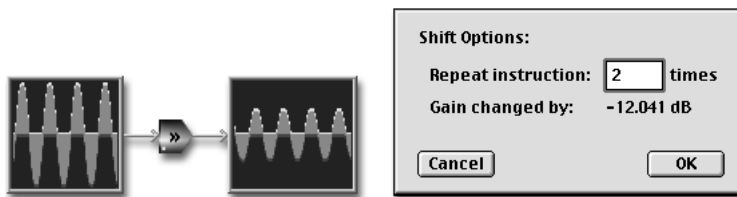
Controls: 0

Bypass: yes

Mute: yes



The shift right module reduces the input signal by half. The equivalent reduction in dBs is -6.02 dB.



The Shift Right Module has an Options window, which can be accessed by clicking on the white dot at the bottom left of the module or by double-clicking in Edit Mode. A box allows you to insert the number of times you want to insert these modules. This is useful because, in certain algorithms, you may wish to insert multiple modules of this kind, as if they were in a serial chain. However, you'll only visualize the module once, to save screen space.

## 8- SHIFT LEFT

---

Number of instances: 12 in total together with shift right modules

Inputs: 1

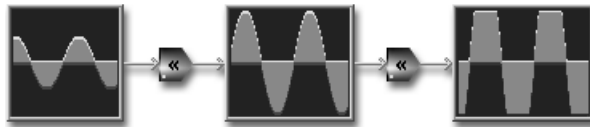
Controls: 0

Bypass: yes

Mute: yes



Shift left doubles the input signal. It increases its level by 6.02 dB. Note that shift left can lead to clipping distortion, if not properly used.



The same options apply as to the Shift Right module.

## 9- ABSOLUTE VALUE

---

Number of instances: 6

Inputs: 1

Controls: 0

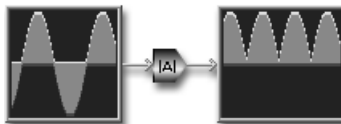
Bypass: yes

Mute: yes



The absolute value function converts all negative input values to positive, leaving all positive values the same.

A "-5" value would be turned to "+5", and a "+6" level would remain untouched.



## 10- INVERT

---

Number of instances: 6

Inputs: 1

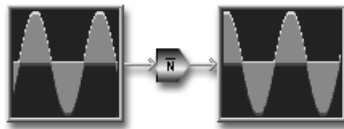
Controls: 0

Bypass: yes

Mute: yes



The invert module multiplies the entered signal by "-1". This is equivalent to a 180 degree phase change.



## 11- ADDITION (and logical operator)

---

Number of instances: 16 together with subtraction and multiplication modules

Inputs: 2

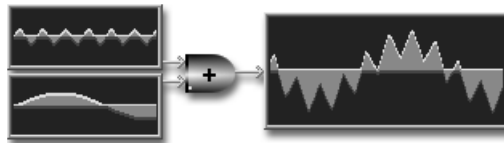
Controls: 0

Bypass: yes

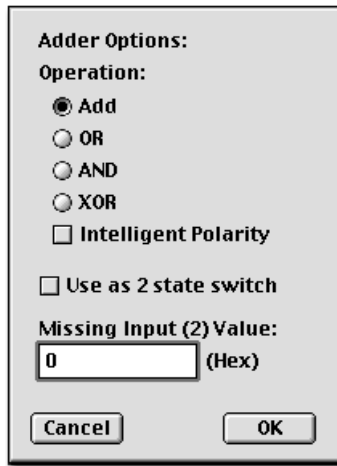
Mute: yes



This module takes the inserted signals A and B and adds them ( $A+B$ ), although you can also use this module as a logical operator for OR, AND and XOR ("exclusive OR") functions and even as a switch.



In order to choose the operation you want the addition operator to process, double click on the module in Edit Mode.



**Adder Options:**

**Operation:**

- ☒ Add
- ☐ OR
- ☐ AND
- ☐ XOR

☐ Intelligent Polarity

☐ Use as 2 state switch

**Missing Input (2) Value:**

(Hex)

You can then select the operation (ADD, OR, AND or XOR).

A	B	OR Out	AND Out	XOR Out
0	0	0	0	0
1	0	1	0	1
0	1	1	0	1
1	1	1	1	0

You can activate the "Intelligent Polarity" box to avoid problems with signed signals.

The "Missing Input (2) Value" box allows you to set a value for the second input without the need to connect an external signal. This is suitable for all those cases in which one of the inputs remains constant.

These logical functions are very useful for creating certain kinds of distortion effects, as well as dithering.

You can also use this module as a 2-state switch. When using this option, the module will act as a two-state bypass between inputs A and B. In this case you will visualize the addition icon bypassed on the blackboard. The missing value, which can be modified in the module's edition dialog box, is still relevant, since it is easy to create a Bypass/Mute function by making the missing value zero and not connecting the second input. On the other hand, if we have to complete sections of DSP, we can select one or another by connecting both sections to both module inputs and selecting the 2-state switch option.

## 12- SUBTRACTION

---

Number of instances: 16 in total together with addition and multiplication

modules

Inputs: 2

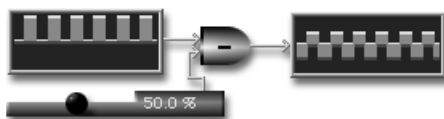
Controls: 0

Bypass: yes

Mute: yes



The SUBTRACTION module subtracts the value of the second input from the first. If you insert signals A to the first input and B to the second, the result will be  $A - B$ .



Please remember that the signal to be subtracted must be inserted into the second input, as can be seen in the figure above.

## 13- MULTIPLICATION

---

Number of instances: 16 in total with addition and subtraction modules

Inputs: 2

Controls: 0

Bypass: yes

Mute: yes

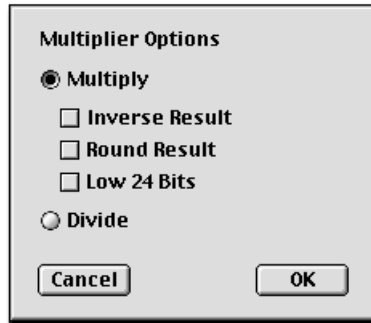


This module is used to multiply or divide two signals.





Double click on the module in Edit mode and you will be able to choose between several options:



**MULTIPLY:** Use this option to use the module as a multiplier.

Multiplier functioning as a multiplier

**Inverse result:** The result given by the module is  $-A*B$

**Round result:** The result is rounded, taking out the least significant 24 bits.

**Low 24 Bits:** Takes the least significant 24 bits as the result. Remember that the operation is 48-bit wide.

## **DIVIDE:**

Multiplier functioning as a divider

Select this option to use the module as a divider. If you insert signals A and B according to the figure below, the result will be  $(A:B)$ . This is the division of one quadrant for non-fractionary integer numbers with a fractionary result. This means that, for example, dividing number 20 by number 40 will produce an integer value of 4194304, equivalent to a 50% or -6.02 dB.

**IMPORTANT!: You must remember that dividing by zero will give the maximum possible value in that scale as a result (0dB in dB, 100% as a percentage and so on)**

It's also important for the user to know that using a multiplier is not the only way to amplify signals. There are four ways of amplifying signals:

- a) Using a shift left module, which increases the original value by 6.02 dB.
- b) To create the same effect as the above mentioned, you can insert the same signal into both signal inputs of an Addition module. The resulting signal is exactly twice the original signal, which corresponds to +6.02 dB.
- c) You can also amplify a signal by inserting it into a MIXER several times (see module number 32 for complete information) and controlling the values with the use of sliders as

gain controllers or by setting the values in the mixer dialog box. Mixers have four inputs, which means the maximum amplification you can achieve is +12.04 dB. This corresponds to inserting the signal in every channel of the mixer with a 0dB attenuation.

In the diagram below we can see the amplification values according to the number of channels added with a 0dB attenuation (for more than four channels, use more than one mixer and add their outputs with ADD modules):

Number of channels at 0dB att.	Amplification
2	6.02 dB
3	9.54 dB
4	12.04 dB
5	13.98 dB
6	15.56 dB
7	16.90 dB
8	18.06 dB

**d)** By using dividers: for example dividing by 0.5 the input signal will be doubled (this is only the case with positive signals)

## 14- NOISE GENERATOR

---

Number of instances: 1  
Inputs: 0  
Controls: 1  
Bypass: no  
Mute: yes



This module is a pseudo-random white noise generator.

This module has no input signal, as it's a stand-alone generator. The amplitude of the noise signal can be set by the control input. One possible way to do so is by inserting a slider into the amplitude input controller to specify the level or double click on the module in Edit mode and you will be able to set a desired level:



## 15- SAMPLE & HOLD

---

Number of instances: 2

Inputs: 1

Controls: 1

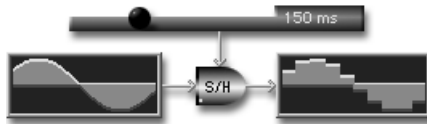
Outputs: infinite

Bypass: yes

Mute: yes



This module performs the "sample and hold" function widely used by synthesizers in the analogue world.



The S&H module stores the input signal in memory during a period of time specified with the control input, preferably a slider. Please remember that the value must be set in seconds or milliseconds. Double click on the module in Edit mode and you will be able to set a desired hold time:



## 16- ONE-POLE LOW-PASS FILTER

---

Number of instances: 8 in total together with one-pole high-pass filters.

Inputs: 1

Controls: 1

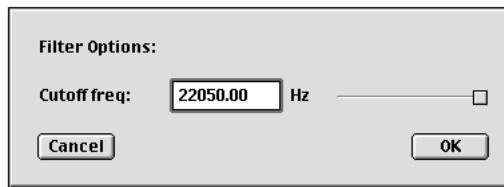
Bypass: yes

Mute: yes



This filter has a -6dB/octave slope beginning at the cutoff frequency stated with the control input at the top of the module, marked with a "C" (which stands for 'cutoff'). This frequency can be specified with a slider.

One-pole filters are very useful for shelving equalization and other gentle processing functions. Double click on the module in Edit mode and you will be able to set the cutoff frequency when an external connection is missing:



## 17- ONE-POLE HIGH-PASS FILTER

---

Number of instances: 8 in total together with one-pole low-pass filters.

Inputs: 1

Controls: 1

Bypass: yes

Mute: yes



The one-pole high-pass filter has a -6dB/ octave slope leading to the specified frequency (adjust with a slider) and then remains constant at a 0dB gain level towards the high spectrum frequencies. There is a gentle transition around the cutoff point. (Please read the one-pole low-pass filter specifications). Double click on the module in Edit mode for further options.

## 18- TWO-POLE LOW-PASS FILTER

---

Number of instances: 8 in total together with the rest of two-pole filters.

Inputs: 1

Controls: 2

Bypass: yes

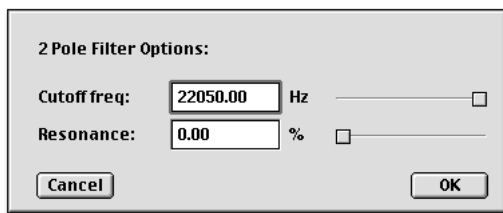
Mute: yes



Two-pole low-pass filters have a -12 dB/octave slope starting at the **cutoff frequency**, which can be controlled -for instance- with a slider. You can visualize the frequency you have selected with the slider by connecting a "Numeric Readout" module and setting it in Hertz or kilohertz.

Two-pole filters have a second control which allows adjustment of the **Q** factor, which is a **resonance** parameter. This value indicates the width of the peak around the cutoff frequency. When adjusting it, you should consider that analogue values are not equal to digital values, and therefore a typical 0.5 **Q** factor in the analogue world would not correspond identically to that in the digital domain.

Remember that you can either control the **Q** value with a slider or with an external signal, which can be obtained from a module. In such a case, it's important that you insert an absolute value module between the module you're taking the signal from and the point to which you are going to insert the **Q** value, at the top of the two-pole filter. This is fundamental, as a negative value **Q** makes no physical sense. Therefore, only a positive value is valid in controlling the **Q** factor. Double click on the module in Edit mode, or use the Hotzone in Run mode to access the Options window for this module.



## 19- TWO-POLE HIGH-PASS FILTER

---

Number of instances: 8 in total together with the rest of two-pole filters.

Inputs: 1

Controls: 2

Bypass: yes

Mute: yes



Two-pole high-pass filters have a -12 dB/octave slope which turns to a constant 0dB as it approaches the cut-off frequency (the Q factor, which is controlled by the user, can make the cut-off frequency value move a few Hz above or below the specified frequency value), and remains at this level throughout the rest of the spectrum towards the high frequencies. The Q value indicates the width of the peak around the cutoff frequency. Double click on the module in Edit mode to access the module's options.

## 20- TWO-POLE BAND-REJECT FILTER

---

Number of instances: 8 in total together with the rest of two-pole filters.

Inputs: 1

Controls: 2

Bypass: yes

Mute: yes



The band-reject filter allows you to attenuate a range of frequencies, which are defined with the center frequency value and the Q factor. These two controls can both be specified with sliders.

The Q factor determines the width of the frequency range to avoid starting at the frequency value set in the left control. The lower Q value you set, the narrower the frequency range to be omitted will be. If you choose a very high value Q, you will be rejecting a wide range of frequencies. Double click on the module in Edit mode to set the optional values for this module.

## 21- TWO POLE BAND-PASS FILTER

---

Number of instances: 8 in total together with the rest of two-pole filters.

Inputs: 1

Controls: 2

Bypass: yes

Mute: yes



The two-pole Band-pass filter rejects all frequencies outside the frequency range selected with both the frequency control and the Q factor. The range of non-attenuated frequencies will vary according to the value of the Q factor. For this module, a high Q value will mean you will be attenuating all frequencies outside a very narrow range around the frequency specified with the left control (center frequency control). If you choose a low Q value, you will be letting a wide range of frequencies pass through the filter.



## 22- OSCILLATOR

Number of instances: 4 in total shared with Dynamic Wave Generators, Wave Scan and Karplus-Strong modules.

Inputs: 0

Controls: 2

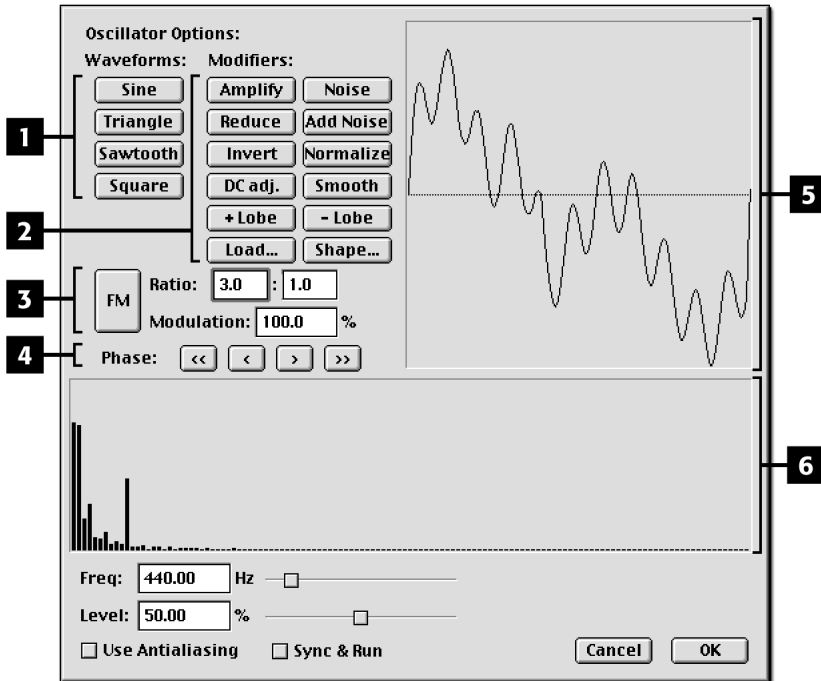
Bypass: no

Mute: yes

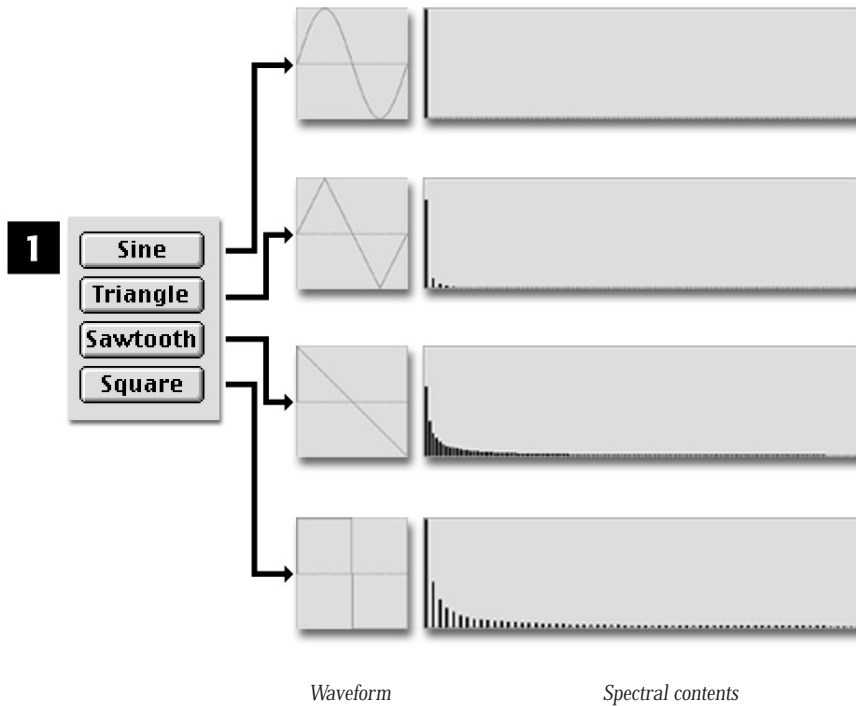


This is a multi-waveform generator.

Double click on the module when you're in Edit Mode or press Opt and click in Run Mode. A complete dialog box will appear:

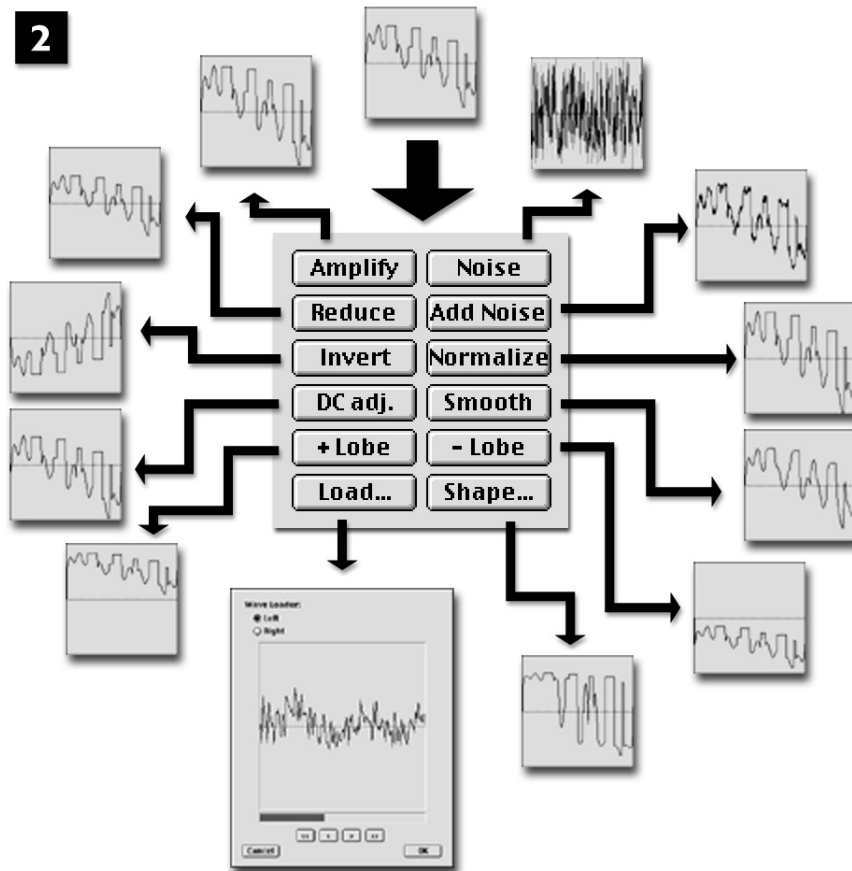


On the left you will be able to click on one of the following Default signals:



When you have clicked on your signal choice, a display screen on the right of the dialog box will show the signal in a time domain. Another screen at the bottom of the dialog box will display the signal on a frequency scale: the signal's spectrum.

On the second column at the left of the dialog box you have 12 Modifier options:



**Amplify:** Click to amplify the signal, which is "cut" when surpassing the limits of the box where the graphic signal is represented (right of the dialog box).

**Reduce:** Click here to attenuate the amplitude of the signal.

**Invert:** Introduces a 180 degree inversion.

**DC adj:** Allows you to set an offset value for the signal.

**Smooth:** Reduces high frequency harmonics.

**+Lobe:** Converts the wave to positive values keeping the same shape.

**-Lobe:** Converts the wave to negative values keeping the same shape.

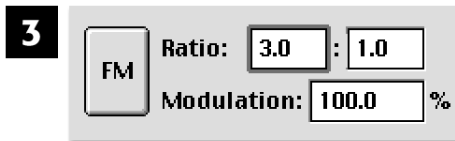
**Noise:** Fills the wave with white noise.

**Add Noise:** Adds white noise to the existing wave.

**Load...:** Lets you read audio from external Sound Designer II audio files.

**Shape...:** Lets you modify the current wave with a Shaper function.

There is also a ratio dialog box and a modulation percentage value which can be set by the user when generating an FM signal:



You can set the Frequency Modulation Ratio and depth to build FM waves using sine modulators and carriers. In this case the modulation is static. As an alternative, you can build FM synthesis using several modules and modulation sources and dynamic amounts using Envelop Generators modules.



You can modify the phase of the wave in 1-sample steps (1.4 °) and 32 steps (45°).



Another interesting feature is the possibility to edit the signal frequency. Click on the frequency you wish to enhance or diminish and move the mouse vertically upwards or downwards to achieve an amplification or reduction of certain harmonics.

To draw a DC signal, hold shift while drawing with the mouse on the time-domain window in the dialog box. This will enable you to draw a straight line.

To delete, hold Cmd and drag. You can delete either in the time or frequency domain windows.

The controls at the top of the module are marked with an 'F', 'A' and an 'S'. The first allows you to select the frequency of the signal which is going to be generated. The values you can choose

range from zero to half the sample rate frequency. The 'A' control lets you change the amplitude. The 'S' allows you to use other frequency sources (such as Sync signals) in order to create additional harmonics.

The '**Use Antialiasing**' button is provided to eliminate digital noise produced on high-pitched sounds when the harmonic content of the wave exceeds the Nyquist frequency. This option consumes additional DSP cycles. If you plan to use a Oscillator as a Low Frequency Oscillator (LFO), you can disable this option.

## 23- TRIANGLE OSCILLATOR

---

Number of instances: 2

Inputs: 0

Controls: 2

Bypass: no

Mute: yes



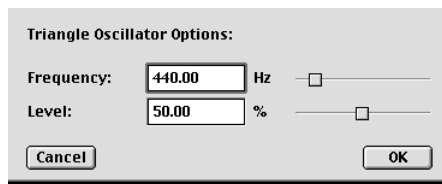
This module is a fixed triangular-signal generator. It is very suitable for LFOs and sound synthesis generation.

The controls at the top of the module are:

'F': it allows you to select the frequency of the triangular signal which is going to be generated. The values you can choose range from zero to half the sample rate frequency.

'A': this control lets you change the amplitude.

Double click on the module in Edit mode to access the dialog box to set these values.



## 24- SQUARE OSCILLATOR

---

Number of instances: 2

Inputs: 0

Controls: 3

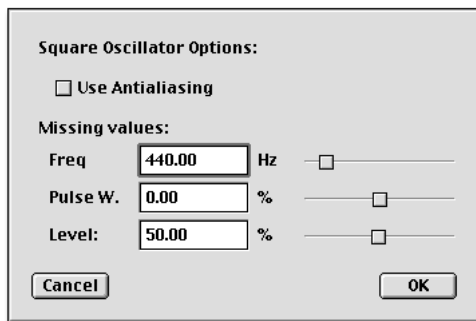
Bypass: no

Mute: yes



This module is a fixed square wave generator with pulse width control. It is suitable for generic odd harmonic waves and pad sounds in which the pulse widths are modulated by LFO's.

To edit the parameters from a dialog box, click on the hotzone white dot or double-click on the module while in Edit Mode.



The 'Use Antialiasing' button is provided to eliminate digital noise produced on high-pitched sounds when the harmonic content of the wave exceeds the Nyquist frequency. This option consumes additional DSP cycles. If you plan to use a Oscillator as a Low Frequency Oscillator (LFO), you can disable this option.

## 25- PITCH TRACKER

---

Number of instances: 1

Inputs: 1

Controls: 1

Bypass: yes

Mute: yes



The pitch tracker module is a period-to-frequency converter. The output is a control signal (not an audio signal)

The 'T' control at the top of the module is a threshold parameter which disables pitch-tracking above the selected value. This threshold is a frequency threshold, not an amplitude threshold, which means that the module will not track frequencies above this value.

## 26- RAMP GENERATOR

---

Number of instances: 2

Inputs: 1

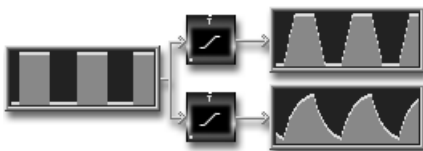
Controls: 1

Bypass: yes

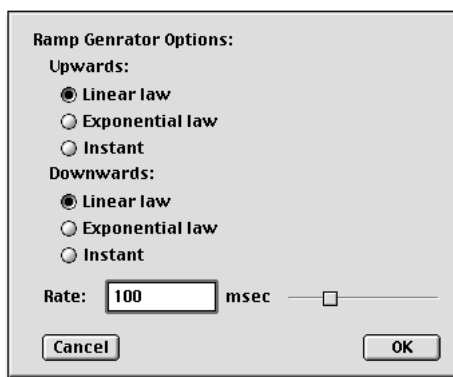
Mute: yes



This module smoothens out the input signal in a gradual way. This "smoothness" is controlled with a time constant, which can be set with the "T" control at the top of the module. This value must be in seconds or milliseconds (AR ) (attack/release).



You can create a ramp choosing the kind of slope both upwards or downwards. The selectable options are in the dialog box which appears on double-clicking in Edit mode:



**Linear:** The generated signal between two points is a straight line which joins them.

**Exponential:** The two points are joined by an exponential curve.

**Instant:** The resulting signal is formed by joining both points instantly.



## 27- SHAPER

---

Number of instances: 2 shared with Chorus modules.

Inputs: 1

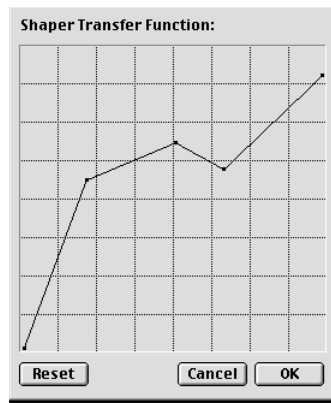
Controls: 0

Bypass: yes

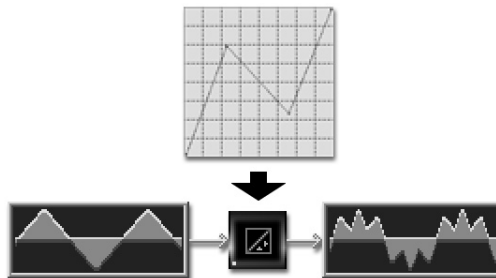
Mute: yes



The shaper module is basically a user definable waveshape transformer, whose X axis represents the original input waveform and Y axis the desired output.



You can draw the transfer function with 8 linear segments. When you enter the dialog box (double click in Edit Mode) you will see a 45 degree line crossing the transfer function axis, meaning the input signal is identical to the output. To modify this line, simply click and drag the point to draw the new function curve.



To delete a point you have already marked, hold Opt and click. If you hold Shift and drag you will move the point to a 1:1 slope function.

We can draw some conclusions:

- 1) in the linear case only volume changes are produced by moving the line's highest point.
- 2) any curve above the linear shape will amplify the sound and introduce some kind of non linearity.
- 3) any abrupt change in the shape, as in diagram...., could produce heavy non-linearities.
- 4) shapers can be used for the processing of both audio and control signals.

## 28- ENVELOPE FOLLOWER

---

Number of instances: 3

Inputs: 1

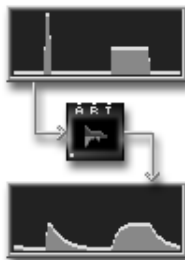
Controls: 3

Bypass: yes

Mute: yes



The envelope follower module generates a control signal whose amplitude is proportional to the input signal amplitude. The output of this module will try to follow the amplitude of the input signal, following a criteria of time response and shape type.



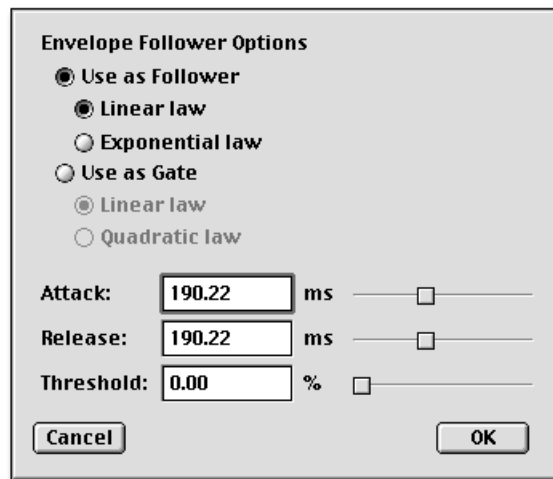
**Attack:** This parameter indicates the time the module takes to respond to any fluctuations in the input signal. It is usually measured in mili-seconds (or seconds). So if you control this value with a slider, you should use it in the AR mode (either miliseconds AR or seconds AR).

**Release:** The 'release' value indicates the length of time throughout which the signal decay will take place when dropping from a certain amplitude to a lower value.

**Threshold:** Set this parameter to set the level above which the module must be sensitive. During an envelope analysis a signal will not be detected below this level. If you set a 3dB value, the output from the envelope follower module would remain constant or decay (according to the release time) until a 3dB or higher signal was inserted into the module.

Double click on the module in Edit mode. A dialog box will appear, allowing you to choose between a linear or an exponential follower. This means that the increase and the decay of the signal follow a linear or an exponential curve.

The module can also operate as a gate, with either a linear or a quadratic law. The threshold value determines the triggering value. This gate is opened and closed according to the attack and release settings previously mentioned.



The dialog box is titled "Envelope Follower Options". It contains two main sections. The first section has two radio buttons: "Use as Follower" (selected) and "Use as Gate". Under "Use as Follower", there are two radio buttons: "Linear law" (selected) and "Exponential law". Under "Use as Gate", there are two radio buttons: "Linear law" (selected) and "Quadratic law". The second section contains three rows of controls: "Attack:" with a text box containing "190.22" and a slider to its right; "Release:" with a text box containing "190.22" and a slider to its right; and "Threshold:" with a text box containing "0.00" and a slider to its right. At the bottom left is a "Cancel" button and at the bottom right is an "OK" button.

## 29- ENVELOPE GENERATOR

---

Number of instances: 6

Inputs: 1

Controls: 5

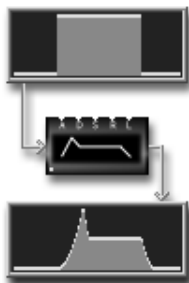
Bypass: yes

Mute: yes



The Envelope Generator module is in charge of generating control signals to be used as gain values, cutoff filter values, pitch changes using attack, decay, sustain, release and envelope level parameters. These signals are usually positive and they're used together with other modules (multipliers, filters ..).

The input signal of this module corresponds to the Gate information and it will determine the trigger of the envelop in the following way: if the signal is zero, the output signal won't generate an envelope. For any signal different from zero, an envelope signal will be created, proportional to the module's parameters.



**Envelope Generator Options:**

☐ Quadratic law  
☐ Inverse  
☐ Attack Reset

**Missing values:**

Attack:  ms ☐

Decay:  ms ☐

Sustain:  % ☐

Release:  ms ☐

Level:  % ☐

Double-click on the module in Edit mode. A dialog box will appear, and you can modify the output options to a quadratic law, and you can also invert the output signal, which can be very useful to control pitch parameters.

If you don't need to control parameters externally, you can just adjust them via the dialog window that appears by double-clicking on the module in Edit mode.

## 30-DYNAMIC WAVE GENERATOR

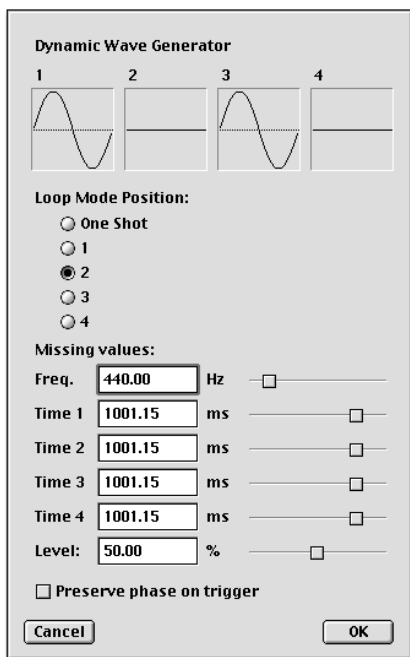
Number of instances: 4 in total shared with the Oscillator, WaveScan and Karplus-Strong modules.

Inputs: 1

Controls: 6

Bypass: no

Mute: yes



The Dynamic Wave Generator is a new type of oscillator based on 4 waveforms. These waveforms will constitute one waveform at the output, in such a way that the first waveform will fade into the second waveform and so on, according to the time values configured in the module's Options. These values will allow you to determine how fast you want one waveform to transform into the next one. While the output waveform is transforming from one of the waveforms into another, a hybrid waveform will be generated.

This module accepts a "Trigger" input signal which is understood as the moment when you hit a key on your MIDI keyboard, but it can be subject to any other control signal generated within SynthSpider (according to your algorithm). This trigger determines the startpoint of the algorithm and it will play the first waveform in the chain of available waveforms (waveform number 1 in the dialog box).

By double-clicking on the module in Edit mode, a dialog box will allow you to edit the internal parameters:

The four waveforms you can see in the figure above (1, 2, 3 & 4) are the basic waveforms that will form the complete sound output by this module. These individual waveforms can be edited. To do so, click on any of these small waveforms, and a dialog box will open, identical to the window that appears in the Oscillator module.

You can also copy one waveform to another (for example, copy waveform 1 to waveform 3) by holding the CTRL key and dragging the waveform from one window to another.

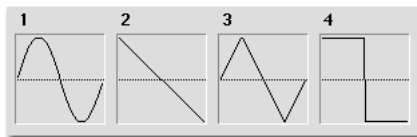
In the dialog box, the "Loop position mode" determines the way how you want to transform one waveform into another.

In the "**One Shot**" mode, the Dynamic Wave Generator will start to generate cells 1, 2, 3 and 4, and finally it will fade out. The transition time between the waveforms of one cell and the next is set in the "Time" fields. For example, "Time 1" determines the transition time between waveforms 1 and 2.

If you're in "One Shot" mode, "Time 4" will determine the fade out time.

Loop Modes 1 to 4: These modes will start generating waves starting from waveform 1 when it receives a trigger signal, and it will continue generating the signal until it reaches the waveform in cell 4. Then it will jump to cell 1, 2, 3 or 4 (according to which Loop Mode you've chosen) and it will continue generating the signal.

For example, in the figure you can see below, you can see that waveform 1 is a sinus wave, waveform 2 is a sawtooth, there's a triangular waveform in cell 3 and a square waveform is in the fourth cell.



The Dynamic Wave Generator will generate the resulting signal by taking waveforms 1 to 4 and transforming one into the next according to the specified transition times. See the result we will obtain:



Notice the different kinds of waveforms, and how one waveform is converted into the next.

If you don't want the trigger to condition your signal, you should disconnect the input of this control, and therefore you should use any Loop mode different to the "One Shot" option. For example, use the "1" option, in which case you'll have an infinite signal.

The "**Preserve Phase on Trigger**" option ensures that the phase will be preserved if a trigger has occurred. This option is recommended for non-percussive waveforms.

Some additional considerations should be taken for better operation of this module: using waveforms of high harmonic contents when the oscillator has a high frequency control can give you digital distortion. To minimize the distortion you can limit the spectrum of the waveform (remove the higher-frequency contents). To do this, click on the cell you want to edit. Hold the CMD key while you click on the spectral contents you want to remove. They will be erased. In your case, you want to remove the contents displayed on the right.

## 31-SEQUENCER

---

Number of instances: 4

Inputs: 0

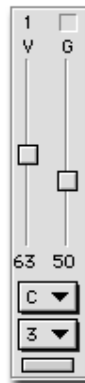
Controls: 0

Bypass: no

Mute: no

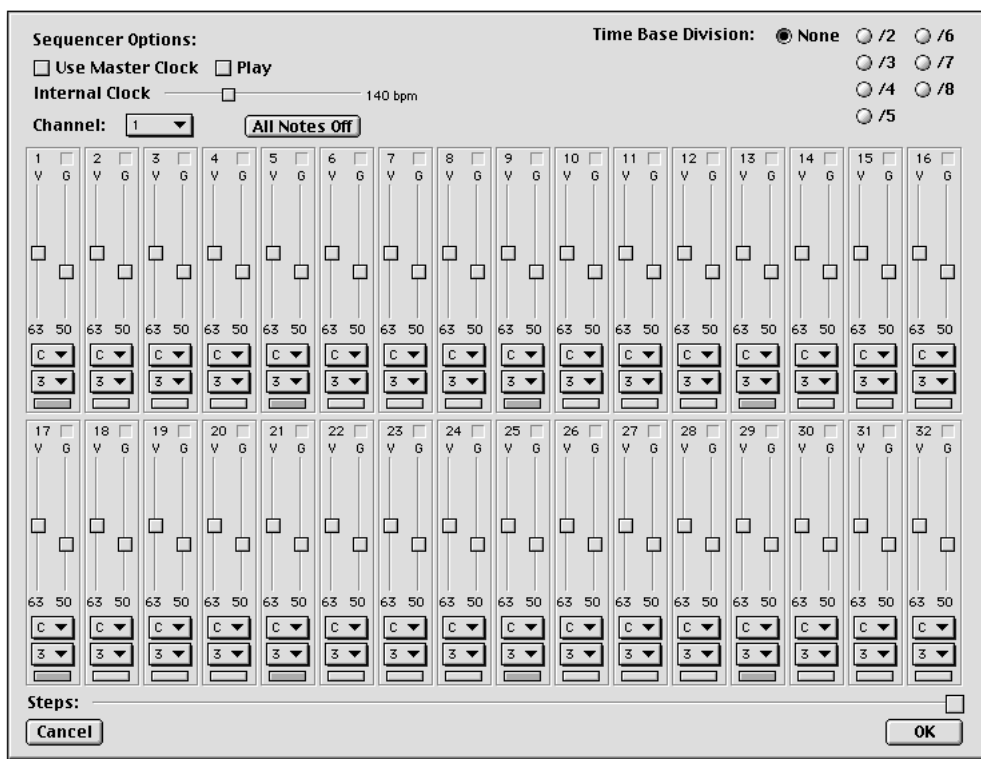


The Sequencer module implements the functions of the first analog sequencers. It has 32 steps and it allows you to enter notes, silences and legatos in each one of these 32 steps.



Each step allows you to choose the Note information, as well as the octave. You can do this from the pop-up menus. In the image you can see a "C3" note (selected from the selection buttons at the bottom). You can also define the Velocity and Gate values ("V" and "G") for each note. Below the octave control, you can choose the ON/OFF state of the note for that step.

You can make a note sound for longer than one step (legato). To achieve this, the Gate sliders for the steps you want the sound to last must be at 100%, and all these steps must be playing the same note. The Velocity used will be that of the first step of the group.



The number of steps can be reduced, creating patterns of 1 to 32 steps with the slider at the end of the dialog box.

Sequencers have their own timebase, but they can also use a general timebase, which can be externally synced via MIDI Beat Clock. The internal base of each sequencer can be divided independently of the clock source, by using the "/2", "/3"... buttons in the sequencer window.

The information generated by the sequencer will be inserted in the internal SynthSpider MIDI Bus. This is the reason why each sequencer has a MIDI Channel menu. It's not advisable to use sequencers on a MIDI channel that's using an external connection, given the unrelated nature of all the information flowing through the channel.



## 32-MIXER

---

Number of instances: 4

Inputs: 4

Controls: 4

Bypass: yes

Mute: yes o

Mute: no

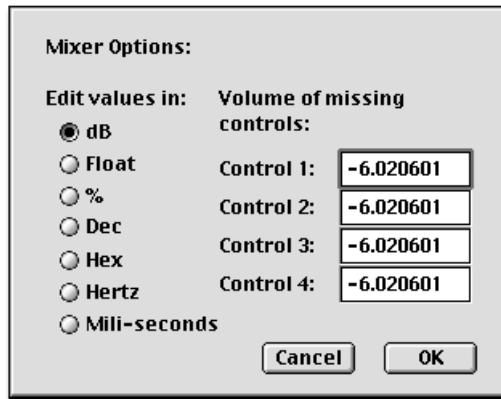


The Mixer module is a 4-channel mixer, and therefore has 4 inputs, which are controlled with the upper controls. You can use a slider for this purpose or double click to set the values in a dialogue box without needing any control connections. The four controls allow external control over each input's gain, but missing controls (those which have not been connected) will use internal values (which can be programmed in Advanced Mode, from the Mixer's dialog box).

The mixer allows negative input controls and can therefore be used as a controllable phase inverter. The negative input controls have the effect of inverting the input signal. You have to consider that you can not obtain phase inversion if you are using a slider set to dB units. This is because the minimum value "-INF" is zero and not a negative value. You have to use other units for this purpose.

You can also use the Mixers as amplifying devices without the need to use shift left modules. However you can not do this with just one input. For example: if you want to amplify a signal by 12.04 dB, you would have to introduce the same signal in the 4 inputs and set the control values to 0 dB. Knowing that adding two identical signals will increase the original value by 6.02 dB and repeating the operation for the other two inputs, we will have the desired value ( $6.02+6.02=12.04$ ). If we wanted a 10.7 dB amplification we would have to set the control values and adjust them accordingly to obtain the desired value at the output.

If you double-click on the mixer in Edit mode, you will be able to edit the control values (amplitude values) from the Mixer Options dialog box. You can choose between editing them in dB, float, %, dec, hex, hertz and miliseconds.



In order to optimize DSP power, we advise you to start with the first channel and then the channel immediately after and so on without leaving "gaps" between them.

### 33- ONE SAMPLE DELAY

---

Number of instances: 8

Inputs: 1

Controls: 0

Bypass: yes

Mute: yes



This is the simplest of all the delay modules. As its name indicates, it delays one sample.

## 34- WAVE SCAN

Number of instances: 4 in total shared with the Oscillator, Dynamic Wave Generators and Karplus-Strong modules.

Inputs: 1

Controls: 3

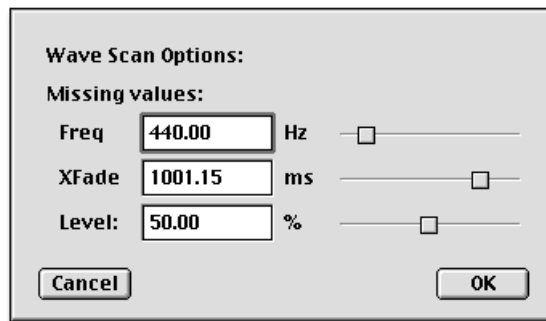
Bypass: yes

Mute: yes



The Wavescan module is thought for reading external audio sources and using them as waveforms to be used in an internal oscillator modules within SynthSpider. These external sources can be any kind of audio information, variable in the time domain. For this reason, the algorithm considers a crossfade time between waveforms to stabilize the used waveform.

The controls for this module are a Frequency parameter, a variable crossfade time in milliseconds and a level control.



This is, therefore, an additional type of oscillator whose waveform is input externally. This means it can either be an external audio track or one of SynthSpider's own internal sources, such as another oscillator.

## 35-KARPLUS-STRONG

Number of instances: 4 in total shared with Oscillator, Dynamic Wave Generators and Wave Scan modules.

Inputs: 1

Controls: 4

Bypass: no

Mute: yes



This module implements the technique designed by Karplus-Strong. This very interesting algorithm simulates the sounds of plucked strings. The sound generation consists in generating noise and feeding it back in with a muffling (dumping) criteria via filters.

The available parameters are: the oscillation frequency, two decay parameters (one to control the pulsation and the second for the vibration of the string). Both these parameters give a special colour to the oscillator. The output level can be controlled externally, either via a slider, an LFO or an envelope controller. By double-clicking on the module in Edit mode, you can access the following options:

**Karplus-Strong Options:**

Freq:	440.00	Hz	<input type="checkbox"/>	
Plug Decay:	3.00	ms	<input type="checkbox"/>	
String Decay:	100.01	ms	<input type="checkbox"/>	
Level:	50.00	%	<input type="checkbox"/>	
Brilliance:	100.00	%	<input type="checkbox"/>	
Dump Factor:	50.00	%	<input type="checkbox"/>	
<input checked="" type="checkbox"/> Antialias filter				
<input checked="" type="checkbox"/> Modulation				
Time:	500.57	ms	<input type="checkbox"/>	
Depth:	50.00	%	<input type="checkbox"/>	

You can also modify the brilliance of the sound of the simulated string and the Dump factor. The modulation of the string is controlled by the Time and Depth parameters.

**IMPORTANT:** This algorithm can generate digital distortion due to the very high frequencial content. For this reason we provide an Antialias filter option. If you still encounter some distortion problems, in which case we advise you to reduce the Brilliance factor.

## 36- CHORUS

---

Number of instances: 2 in total, shared with Shaper modules.

Inputs: 1

Controls: 4

Bypass: yes

Mute: yes

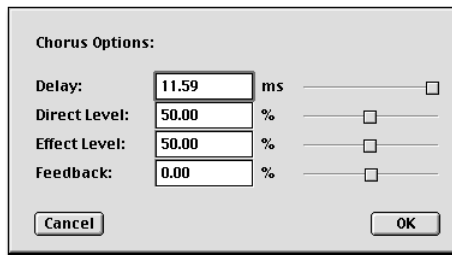


This module allows you to process a signal with a Chorus effect. You may also generate Flangers.

To achieve this, you can control externally the following parameters:

- **D**: Direct signal.
- **Fx**: Effect level.
- **F**: Chorus feedback.
- **M**: Modulation information. This value should normally come from a low frequency oscillator (LFO).

By double-clicking on the module in Edit mode, you can see the module's options:



Apart from the level of the direct signal and the processed signal, you can also control the Feedback and the Delay. The Delay parameter will determine whether the module behaves as a Chorus or as a Flanger effect.

For higher values than 8 miliseconds, the effect is more likely to sound like a Chorus. For values close to 5 miliseconds you'll have a Flanger effect.

Flanging normally needs some feedback. The module accepts positive or negative values for the feedback. If the feedback is below 0%, the flanger needs harmonic contents when it reaches saturation levels.

This module can reach saturation levels for several reasons:

- 1) The Direct signal and the Effect levels can be set up to 100%, so saturation is possible if both of these values are above 50% simultaneously.
- 2) If the Feedback is different from zero, it can add saturation to the feedback loop.

This module has as much saturation effect as any Chorus or Flanger device.

## 37- MIDI NOTE

Number of instances: 4

Inputs: 0

Controls: 0

Bypass: no

Mute: no



The MIDI Note module allows us to establish a link between the "MIDI world" and SynthSpider's modular system. This module provides Note information to oscillators. Therefore, it's providing pitch/frequency information to these oscillators. But the use you can give to this information depends on your algorithm's needs, and you can use it for anything you like.

While you're in Run Mode you can access the MIDI channel via a shortcut by clicking on the module. A pop-up menu will appear, allowing you to select the MIDI channel. If you click with the CMD key held, all the modules in your instance will change the MIDI channel to the value you select.

By double-clicking on the module in Edit mode you can access the internal module's parameters:

**MIDI Note Options:**

Channel:

Pitch Bend:  semitones

Low Note:   Range (0-127)

Hi Note:

Cents:

Random:  % Detune

Interval:

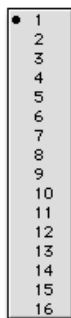
Octave:

☐ Use Custom Table Table Ranges:

Hz

Hz

1) The "**Channel**" list allows you to adjust this module to the MIDI Channel of your choice to generate the signal of the desired frequency. This value is only relevant if the General channel is set to "Multi". Otherwise, the MIDI channel selected in the Palette will be used. If you're not sure which MIDI channel you're using in a module, activate the Balloon help and place the mouse pointer over the module. Among the information that appears on the balloon, you will see the MIDI channel and the assigned voice number.



2) "**Pitch Bend**" is the amount of pitch variation measured in semitones, for a 100% variation of the Pitch Bend control. For example: if the Pitch Bend is set at 12 semitones, by moving the Pitch bend controller on your master keyboard the the most extreme position, the variation would be equivalent to one octave. This field accepts negative values, if you type in "-12", following the example we've just given, you would be decreasing the pitch by one octave when raising the control on your master keyboard.

3) "**Low Note**": In combination with the "Hi Note" you can set the range of notes that will be processed. By setting the Low Note you'll be setting the value under which no notes shall be listened to.

**IMPORTANT!: This parameter is only relevant for monophonic modes. For polyphonic modes, it will be ignored.**

The "**Little Keyboard**" icon allows you to enter the values from an external keyboard.

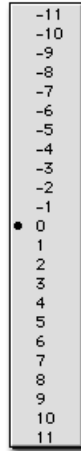
4) "**Hi Note**": see "Low Note".

5) "**Cents**": This parameter enables you to add a frequency variation in semitone cents. Negative values are also accepted.

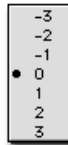
6) "**Random**": This value adds a random variation in frequency, measured in semitone cents. The value will be different every time you generate a new note. This function is very useful if you want to simulate small tuning imperfections. A variation of up to 5% is considered normal and very enriching in certain cases. For values higher than 20%, the diatonic scale would be strangely out of tune.



7) "**Interval**": This menu allows you to set the variation of a certain frequency in semitones. For example: if you hit a "C" note on your MIDI keyboard and we want to hear an "F", we should set the interval to "5".

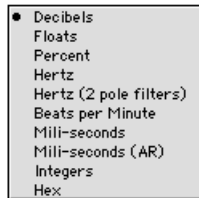


8) "**Octave**": This menu allows you to select the variation of the given frequency in octaves.



9) "**Use Custom Table**": will use the information of the graphic table to generate random values, in the following way:

The X axis will correspond to the MIDI note (from 0 to 127), and the Y axis will be the desired note. This value can have maximum and minimum values, and they can be described in the following numeric formats: Decibels, Float numbers, Percent values, Hertz, Hertz for 2 pole filters, Beats per minute, Miliseconds, Miliseconds for Attack and Release, integer numbers, Hexa number. By clicking on the pop-up menu next to the number, you can change the numeric domain:



## 38- MIDI VELOCITY

Number of instances: 4

Inputs: 0

Controls: 0

Bypass: no

Mute: no



The MIDI Velocity module allows you to establish a relation between the usual MIDI commands and SynthSpider's modular system. This module provides Velocity information, useful for controlling volume, intensity, filters or any other value you desire for your algorithm.

While you're in Run Mode you can access the MIDI channel via a shortcut by clicking on the module. A pop-up menu will appear, allowing you to select the MIDI channel. If you click with the CMD key held, all the modules in your instance will change the MIDI channel to the value you select.

By double-clicking on the module in Edit mode you can access the internal module's parameters:

**MIDI Velocity Options:**

Channel:

Low Note:   Range (0-127)

Hi Note:

Random:  %

**Velocity Table:**

**Table Ranges:**

Maximum  %

Minimum  %

1) The "**Channel**" list allows you to adjust this module to the MIDI Channel of your choice to generate the velocity signal for the desired frequency. This value is only relevant if the General channel is set to "Multi". Otherwise, the MIDI channel selected in the Palette will be used. If you're not sure which MIDI channel you're using in a module, activate the Balloon help and place the mouse pointer over the module. Among the information that appears on the balloon, you will see the MIDI channel and the assigned voice number.

2) "**Low Note**": In combination with the "Hi Note" you can set the range of notes that will be processed. By setting the Low Note you'll be setting the value under which no notes shall be listened to.

**IMPORTANT!:** This parameter is only relevant for monophonic modes. For polyphonic modes, it will be ignored.

The "**Little Keyboard**" icon allows you to enter the values from an external keyboard.

3) "**Hi Note**": see "Low Note".

4) "**Random**": This value adds a random variation in velocity, measured in percentage. Values between 5 and 10% can be very realistic.

5) "**Velocity Table**": will use the information of the graphic table to generate velocity values accordingly to the drawn curve, in the following way:

The X axis will correspond to the input velocity values (from 0 to 127), and the Y axis will be the desired output velocity values. These values can have maximum and minimum values, and they can be in the following numeric formats: Decibels, Float numbers, Percent values, Hertz, Hertz for 2 pole filters, Beats per minute, Miliseconds, Miliseconds for Attack and Release, integer numbers, hexa numbers. By clicking on the pop-up menu next to the number, you can change the numeric domain.

## 39- MIDI GATE

---

Number of instances: 4

Inputs: 0

Controls: 0

Bypass: no

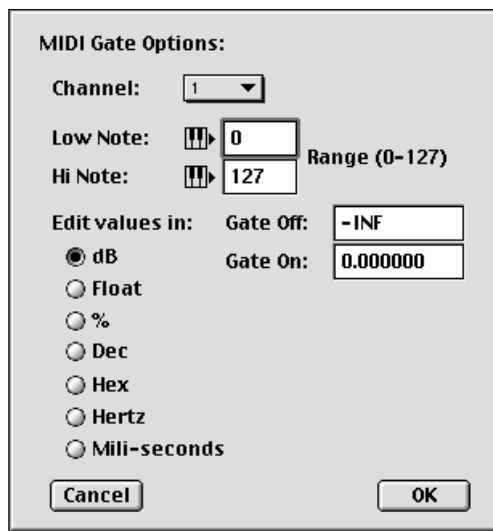
Mute: no



The MIDI Gate module allows you to establish a relation between the usual MIDI commands and SynthSpider's modular system. This module provides Gate information, which is equivalent to the action of pressing or stop pressing a key on your MIDI keyboard. This is useful for controlling trigger parameters applied to Envelope Generators and Triggered Oscillators (Dynamic Wave Generators and Karplus-Strong).

While you're in Run Mode you can access the MIDI channel via a shortcut by clicking on the module. A pop-up menu will appear, allowing you to select the MIDI channel. If you click with the CMD key held, all the modules in your instance will change the MIDI channel to the value you select.

By double-clicking on the module in Edit mode you can access the internal module's parameters:

The MIDI Gate Options dialog box is a light gray window with a black border. It contains the following elements:

- MIDI Gate Options:** The title of the dialog.
- Channel:** A dropdown menu showing the value '1'.
- Low Note:** A piano keyboard icon followed by a text box containing '0'.
- Hi Note:** A piano keyboard icon followed by a text box containing '127'.
- Range (0-127):** Text label to the right of the Hi Note text box.
- Edit values in:** A label followed by two text boxes: 'Gate Off:' containing '- INF' and 'Gate On:' containing '0.000000'.
- Units:** A list of radio buttons for selecting the unit: 'dB' (selected), 'Float', '%', 'Dec', 'Hex', 'Hertz', and 'Mili-seconds'.
- Buttons:** 'Cancel' and 'OK' buttons at the bottom.

1) The "**Channel**" list allows you to adjust this module to the MIDI Channel of your choice to generate the gate signal. This value is only relevant if the General channel is set to "Multi". Otherwise, the MIDI channel selected in the Palette will be used. If you're not sure which MIDI channel you're using in a module, activate the Balloon help and place the mouse pointer over the module. Among the information that appears on the balloon, you will see the MIDI channel and the assigned voice number.

2) "**Low Note**": In combination with the "Hi Note" you can set the range of notes that will be processed. By setting the Low Note you'll be setting the value under which no notes shall be listened to.

**IMPORTANT!: This parameter is only relevant for monophonic modes. For polyphonic modes, it will be ignored.**

The "**Little Keyboard**" icon allows you to enter the values from an external keyboard.

3) "**Hi Note**": see "Low Note".

4) "**Gate ON**" and "**Gate OFF**": These values determine the possible states of the Gate. The format for these numbers can be any of the following: Decibels (dB), Float numbers, Percent values, Decimal numbers, Hexa numbers, Hertz and miliseconds. A Gate can only have two possible states: ON or OFF

**IMPORTANT: As you can see, the GATE OFF parameter can be configured to any value you desire. However, you must be careful if you set a value different from zero, because the trigger detection of other modules (such as Envelope generator) may not understand Gate Off values different from zero. If you selected a different value from zero for the Gate OFF and you fed that information to an Envelope module, the envelope signal would never change when the notes were played.**

## 40- MIDI CONTROLLER

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Number of instances: 4

Inputs: 0

Controls: 0

Bypass: no

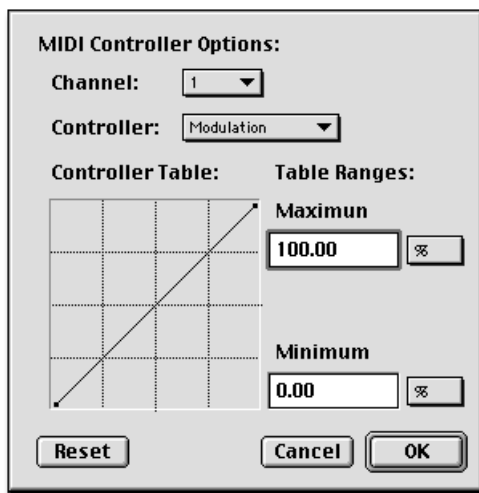
Mute: no



The MIDI Gate module allows you to establish a relation between the usual MIDI commands and SynthSpider's modular system. This module provides controller information.

While you're in Run Mode you can access the MIDI channel via a shortcut by clicking on the module. A pop-up menu will appear, allowing you to select the MIDI channel. If you click with the CMD key held, all the modules in your instance will change the MIDI channel to the value you select.

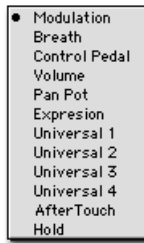
By double-clicking on the module in Edit mode you can access the internal module's parameters:



1) The "**Channel**" list allows you to adjust this module to the MIDI Channel of your choice to generate the control signal. This value is only relevant if the General channel is set to "Multi". Otherwise, the MIDI channel selected in the Palette will be used. If you're not sure which MIDI channel you're using in a module, activate the Balloon help and place the mouse pointer over the module. Among the information that appears on the balloon, you

will see the MIDI channel and the assigned voice number.

2) "**Controller**": This menu shows a list of controls. When you select one, the module will represent that MIDI control. For example, if you select the MIDI "Modulation" control from the list, then the module will be representative of the Modulation control on that insertion of SynthSpider. The selectable controls from the pop-up menu are:



3) "**Controller Table**": will use the information of the graphic table to generate control values accordingly to the drawn curve, in the following way:

The X axis will correspond to the input values (from 0 to 127), and the Y axis will be the desired output values. These values can have maximum and minimum values, and they can be in the following numeric formats: Decibels, Float numbers, Percent values, Hertz, Hertz for 2 pole filters, Beats per minute, Miliseconds, Miliseconds for Attack and Release, integer numbers, Hexa numbers. By clicking on the pop-up menu next to the number, you can change the numeric domain.





## D) Tutorial Guides

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The following tutorial guides give for granted that you already know how to connect SynthSpider using OMS or FreeMIDI. If you want to look through those concepts again, please re-read the Quick Setup Guide in section A of this manual.

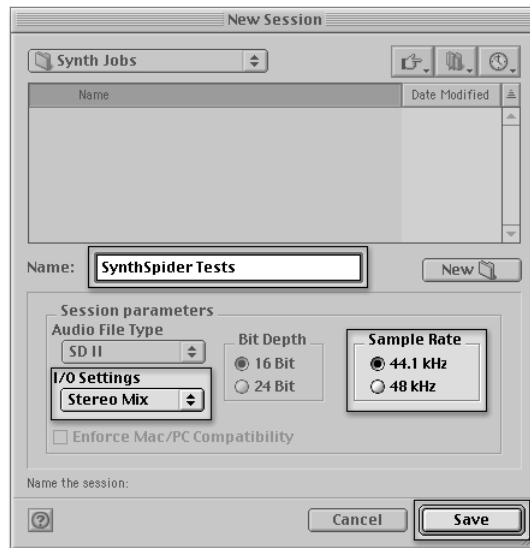
## 1) How to create a track arrangement to use SynthSpider

Let's see how a 4-voice polyphonic group can be created with SynthSpider using Digidesign's ProTools application.

- Double-click on the ProTools icon in your system.
- Create a new session using the "New Session" command in the File menu.

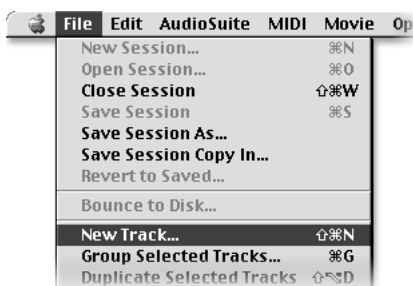


- A dialog box will allow you to choose the settings of the session you want to create, and you will have to enter a name for the session and locate the position where you want to save the session within your hard drive.



- Type a name for your session. For example, "SynthSpider Tests".
- Select the output setting to "Stereo Mix".
- You can choose the sampling rate to 44.1KHz, for example, and click on the Save button.

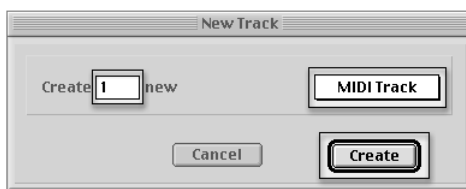
- Once you have created the session, create as many tracks as you need from the "New Track" option in the File menu.



- Type "4" in the number of channels to create.
- Select "Mono" and "Aux Input" from the other options. You could also have chosen "Audio Tracks" instead of "Aux Input".
- Click on the "Create" button.



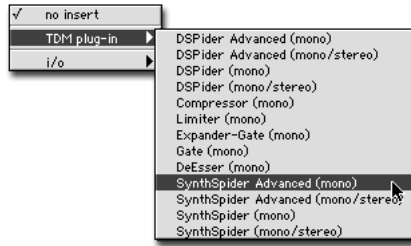
- Repeat exactly the same instructions to create a MIDI track for the session. You only need one.



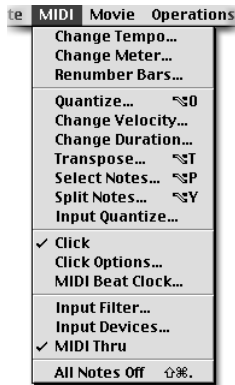
- Finally, repeat the same steps to create a Master Fader for the session. You will need to select "Stereo Master Fader" (only one).



- Now, you can insert in each one of the Auxiliary tracks one instance of "SynthSpider Advanced (mono)", as shown in the image.



- Adjust the "Pan" of each track according to your needs.
- Select a level for your Master Fader.
- Go to your MIDI track, and select "SynthSpider-7" as the MIDI output. We're choosing this channel because it's set as a default polyphonic channel within SynthSpider. You must also choose the MIDI input on your ProTools track, which can be any master keyboard connected to your system. We'll select the "All" option.
- Click the "Rec" button. In combination with the MIDI Thru option, located inside ProTools' MIDI menu, it will route all the MIDI information to SynthSpider's MIDI channel number 7.



This is what your Mix window should look like in ProTools:



- Select the first instance of SynthSpider in the Aux1 track, by double clicking on the "SynthSpA" button.

- Select a sound/preset using the Patch Manager. We've chosen a rather polyphonic sound: a pad combined with a percussive sound.
- Select MIDI channel 7 at the bottom left of the SynthSpider palette.
- Create Group A by selecting capital letter "A" from the Group menu in SynthSpider.



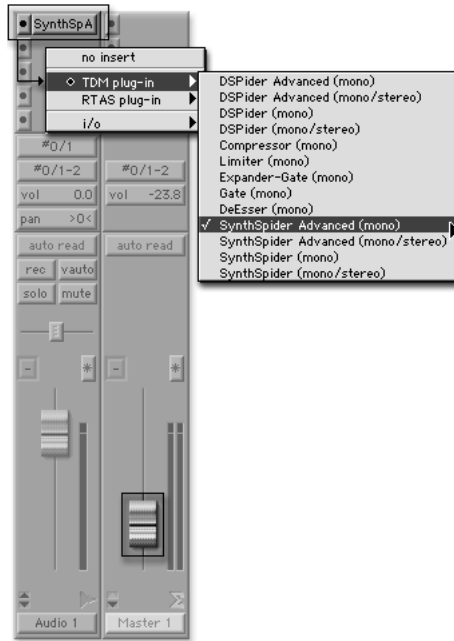
- For the rest of SynthSpider instances, in the remaining auxiliary tracks (Aux2, Aux3 & Aux4), repeat this procedure: select MIDI channel 7 and choose lowercase "a" from the Group menu, in order to "clone" the information in group A (defined by Aux1).

Check that everything is working correctly. Play a few notes on your MIDI keyboard, always controlling the Master Fader level verifying that your signal is not clipping.

## 2) Guide to Build a simple Synthesizer from scratch.

**How can a basic synthesizer be created, using the minimum elements possible?**

Insert a SynthSpider Advanced instance in an audio track or in a mono Auxiliary.



You should also make sure you have a low level in your master fader. You must always be very careful when you're programming and designing sounds. An unexpected level may damage your speakers if you're not careful. Please remember that in the patching process and when programming in general you can hear clicks at the outputs.

As a first step to start programming, select the Synthspider insertion so you can visualize it on your screen.

1 Select Run mode and MIDI channel 1. For the moment, we'll ignore the Group section and leave it set at "none".

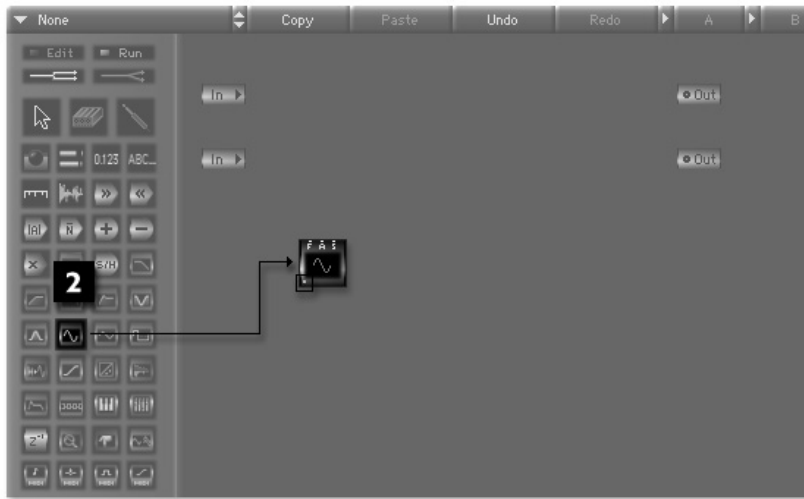


## 2 Creating a sound source: an Oscillator.

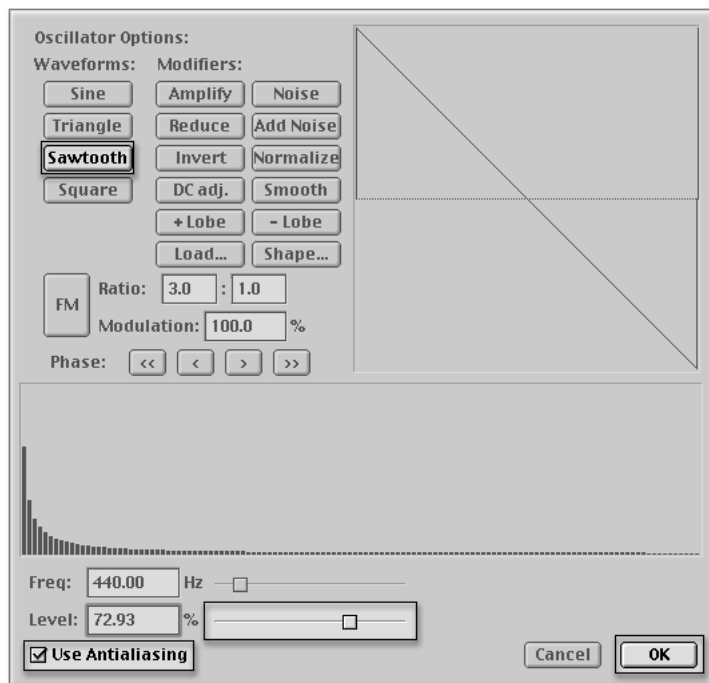
We will choose an oscillator from the palette. It will let us use a standard waveform or draw our own waveforms.

Click on the Oscillator module in the Palette, at the left of the screen, and without releasing the mouse button, we'll drag it onto the working surface. We can now stop clicking the mouse button and release the module over the working surface.





Please notice that the module we've just created has a small white area at the bottom left. By clicking on that point, we can access the internal configuration options for that module.

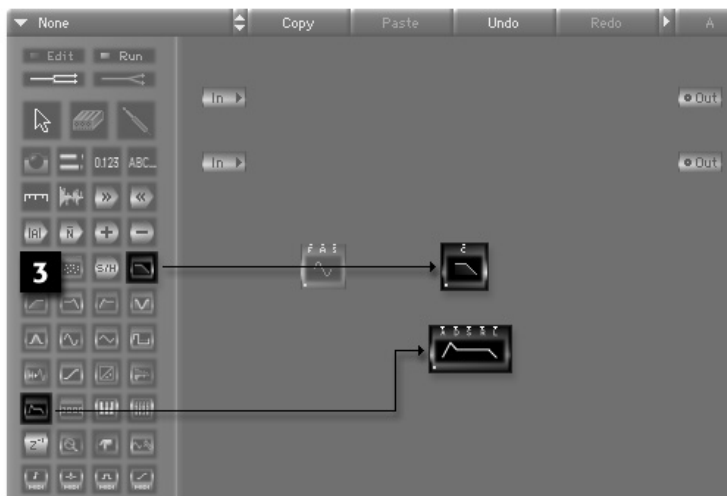


We will first choose a Sawtooth signal, which has spectral contents in all harmonics. We'll define an output level of approximately 70%. We'll also choose the "Use Antialiasing" option, which is necessary in this case given the harmonics contents and the use of the oscillator. We'll now close this window by accepting the changes and clicking OK.

### 3 Creation of a simple harmonics controller:

Our oscillator has a great harmonic content. This should be controlled somehow.

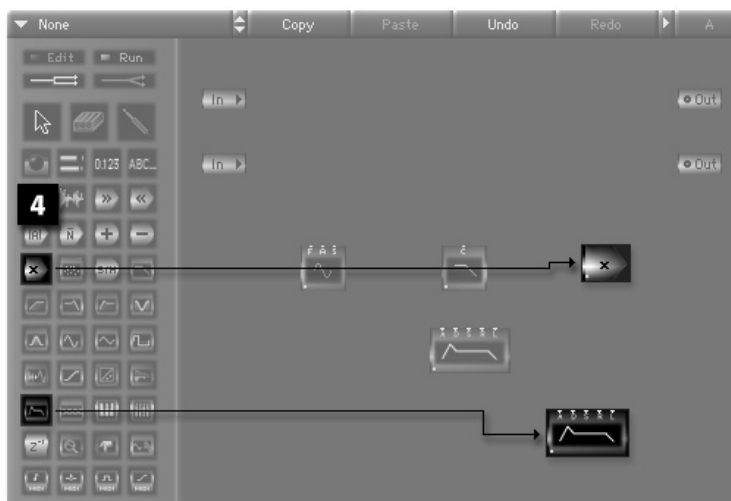
Analog synthesizers normally use low-pass filters to define a brightness for the sound. This section is called VCF (Voltage Controlled Filter) in analog filters, and it contains two components: a filter and an envelope control. We will start by creating a one-pole low pass filter with a future envelope controller. For this step, we'll drag and drop an Envelope Generator module.



### 4 Creating a Gain control:

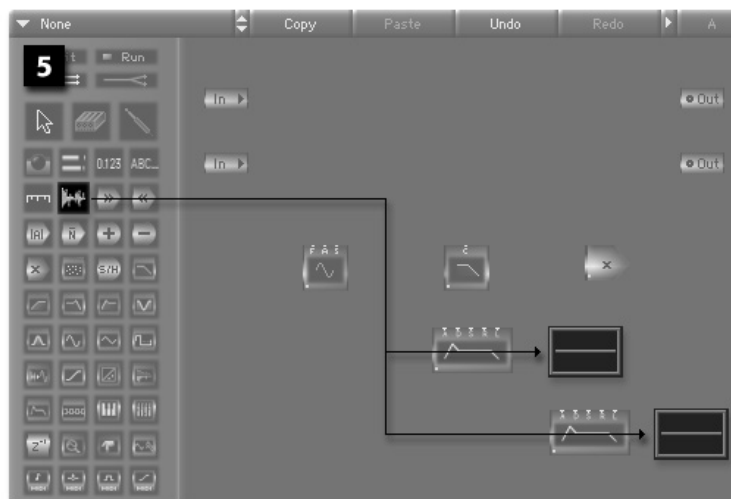
As the last step in the creation of our synthesizer, we must create a controller of output levels that depends on the keyboard's signal. If we didn't do this, the sound would never end and it would go on forever.

This block is called VCA (Voltage Controlled Amplifier) in analog synthesizers and they're usually controlled by an envelope. An envelope generator and a signal multiplier will be enough to create the gain control.



## 5 Optional: Creation of Scopes to visualize the Envelope signals.

We'll create two modules for the visualization of the envelopes that we'll use to control the filter and the output. These modules will make no difference to the sound. They'll only let you see the signal. "Scopes" are just low-frequency oscilloscopes, so you can see signals with a slow evolution.



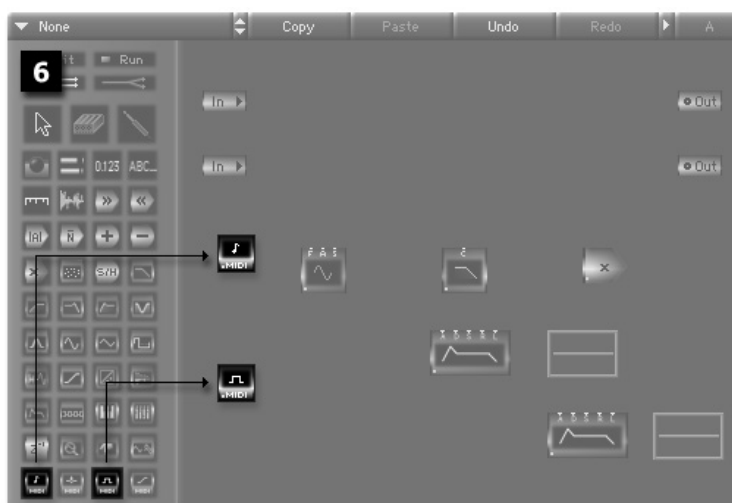
## 6 MIDI Control:

We must create a way to send the relevant MIDI information to the synthesizer.

The MIDI signals and commands are transferred via 4 basic modules: MIDI note, MIDI Velocity, MIDI Gate and MIDI controller. A MIDI Gate is used to give instructions on when the envelopes should be opened and closed, and they usually represent the exact moment when you press or release a key.

A gate follows a binary state. It's either OFF or ON.

The MIDI Gate information is precisely what we should use to feed modules such as the Envelope Generator.



The "MIDI note" module will provide information to our oscillator. The Gate information will be used to tell the envelopes when they should generate their Attack, Decay, Sustain and Release.

## 7 Getting ready to Patch the Synthesizer:

We are now going to start interconnecting the modules to get a correct control of each of the parts of our synthesizer. Make sure you're in Edit Mode. Select the Patcher Tool. Do this in the stated order, or the Patcher tool will not be selected properly.



## 8 Feeding the Oscillator with frequency:

With the Patcher tool active, click inside the MIDI Note module and, while clicked, move the mouse pointer towards the letter "F" at the top of the Oscillator module (inside the module). You can now let the mouse button go.

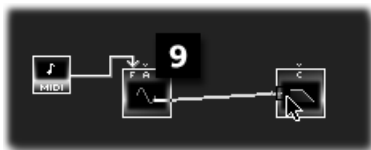
You should now visualize a connection between the MIDI Note module and the Frequency ("F") control at the top of the oscillator module. We're informing our oscillator of the frequency at which it will have to oscillate according to the note we hit on our keyboard.

**IMPORTANT: When you create a connection to a control input, make sure you're precise and that the connection has been done to the correct control. Some modules have many controls and you could mix up one with another. This is what the connection should look like for our example:**



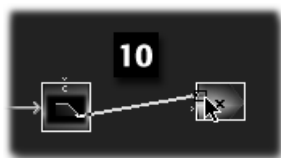
## 9 The Filter comes in...:

We now connect the output of the oscillator to the Filter input:



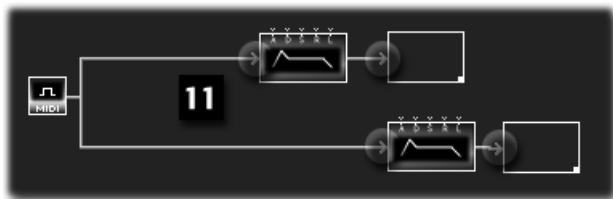
This connection only guarantees that we'll process the output of the oscillator with a filter. We'll see how to configure the connections later on. In the meantime, let's continue by connecting the output of the filter to the output amplifier.

## 10 Connect the output of the filter to the first input (top left) of the signal multiplier.



## 11

We will now inform our envelopes whenever a key of our master keyboard is pressed, so we'll connect the output of the MIDI Gate module to the envelope inputs. Please note that the MIDI Gate's output can be connected to many modules. In this case, we're connecting it to two.

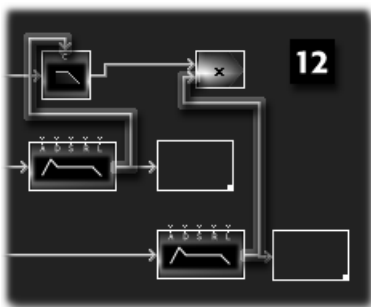


We also connect the scopes of the signals we'll visualize. These are connected from the Envelope Generators to the Scope inputs.

## 12 Controlling the filter and the Output with the Envelopes.

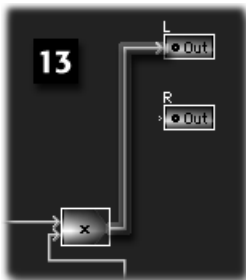
We will take the outputs of the Envelope Generators and we'll connect them to the "C" control of the filter ("Cutoff" of the Low-Pass filter). We'll also connect them to the second input of the signal multiplier.

This will allow us to change cutoff frequency of the filter automatically following the envelope signal, which will start or end its cycle according to when a key is pressed or not.



## 13 We're about to hear our creation!!

We must finally connect the result of the algorithm to the output bus.



This last connection takes the output signal to the TDM Bus within ProTools.

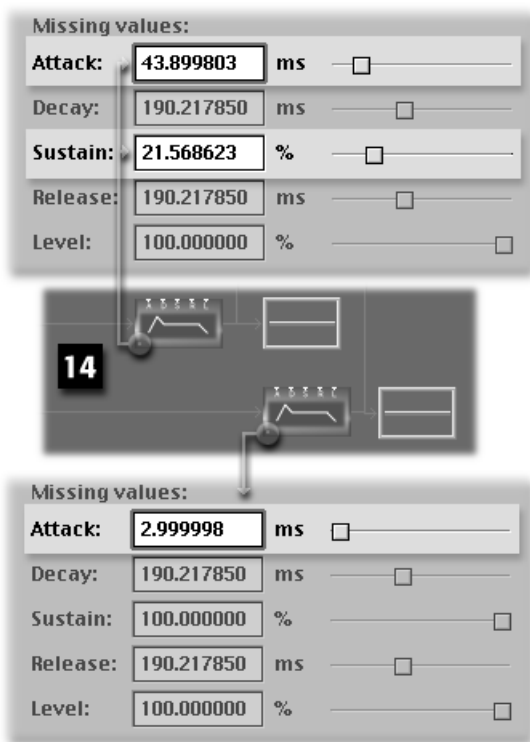
Because we created a mono instance in SynthSpider, we'll only send the signal to one output module (LEFT). Please note the "R" (right) output is disabled.

You can now play your keyboard and listen to the sound you created!!!

## 14 Adjusting the envelopes:

By double-clicking with the Arrow tool on each Envelope Generator module, while in Edit Mode, you will be able to change the parameters of the envelopes.

Let's change the filter's attack to 43 milliseconds, and let's adjust the sustain to 21% approximately.



We should now minimize the amplifier's attack to minimum, moving the slider at the left to its minimum position.

The sound is now slightly faster in response. However, we haven't controlled the amount of filtering.

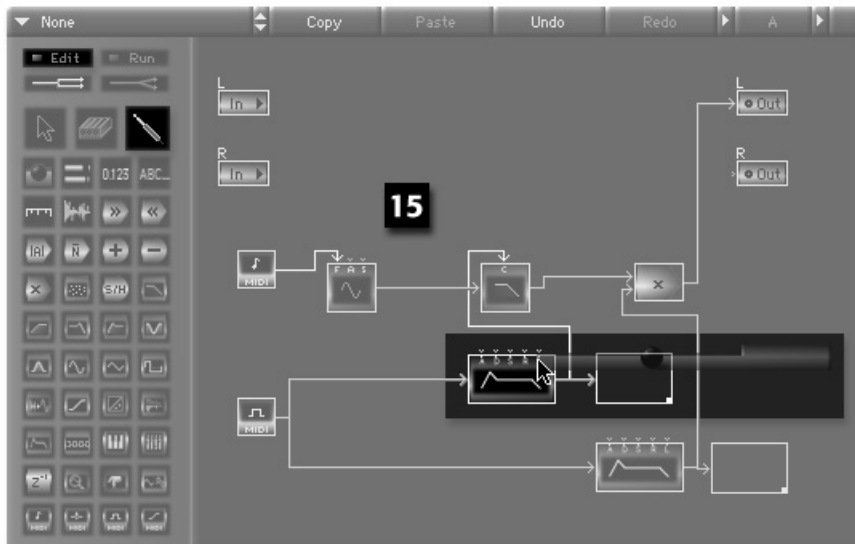


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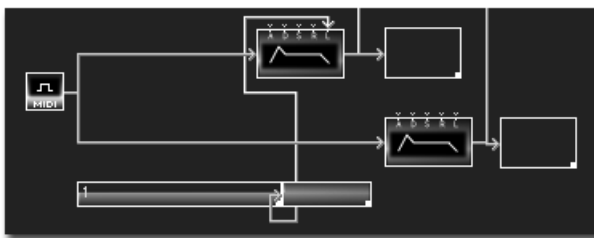
Let's create a control that allows us to define the amount of Envelope we'll apply to the filter. There are many ways to do this, but we'll choose the fastest and simplest way.

With a Slider object we'll be able to quantify the amount of Envelop output level that feeds the filter cutoff.

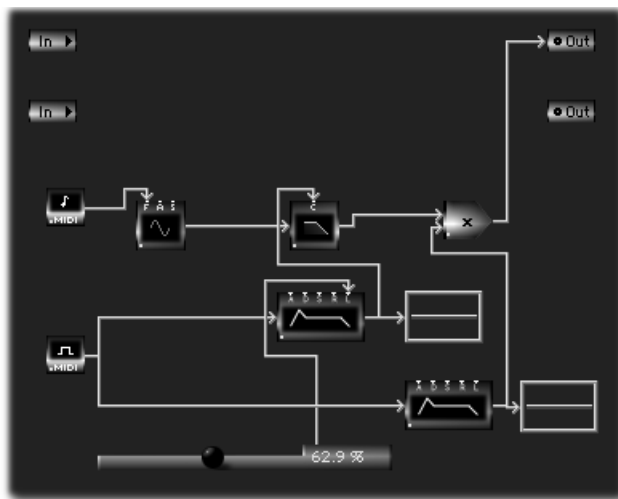
This should be connected to the external "L" control level on the Envelop module to do this control.



We'll use the shortcut that allows us to create a slider, and a visualizer, and it will auto-connect itself in one step. To do this, choose the Edit Mode and select the Patcher Tool. Hold the Command key and, while holding, click on the "L" control on the module while dragging to a free space on the working surface. The elements should be automatically created and patched:



In Run mode, we can adjust the Slider's value and see how the envelope's level is modified as we change the value with the slider:





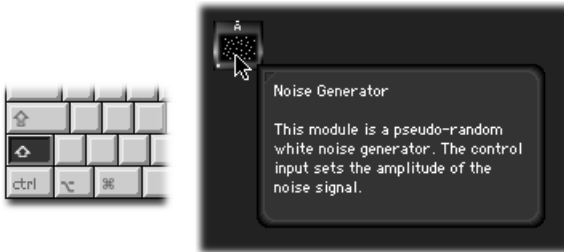


## E) Appendix

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### Commands and Shortcuts:

1) Shift+Point over any object = Help Balloon about the Object



2) Drag Module + Opt = SynthSpider will create a new module and show its internal Options



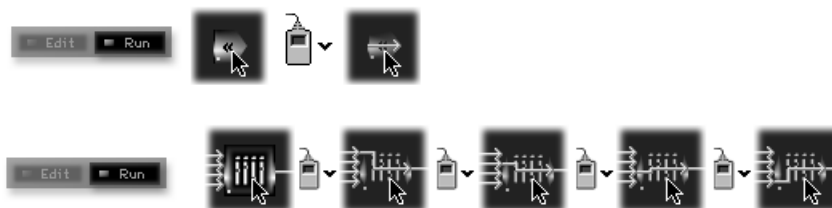
3) Drag Module + Cmd = Creates a new module with the Grid ON



4) Clicking on the Options module zone while in Run mode= Shows internal options (The "Options module zone" is a small white point at the bottom left of the module).



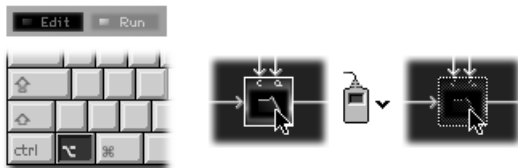
5) Click on a module while in Run mode= Toggles the Bypass state of that module.



6) Cmd + Clicking on a module in Run mode = Toggles the Mute state of that module.



7) Opt + Clicking on a module in Edit mode = Toggles the Hidden state of that module.



8) Double Click on the arrow tool icon while in Edit Mode = Shows all hidden modules



9) Double Click on the patcher tool while in Edit and Manual mode = Resets the calculation count order to zero.



10) Double Click on a certain module while in the Edit mode and Manual modes = increments the calculation count.



11) Click over a module's Control Hotzone and drag onto the working surface while in Edit mode with the Cmd key held and the patcher tool selected = You will automatically create a slider linked to that control. It will be displayed and connected.



12) Click and drag on a module with the Arrow Tool and the Ctrl key down in Edit mode = Clone the module.



